RAILWAY Mechanical and Electrical Engineer

Rip track

# Hobart Repair Yard Increases Santa Fe's Car Output

**Averages 204 cars daily off 16 freight-car repair and cleaning tracks with a total force of 144 men**

LAST November the Atchison, Topeka & Santa Fe started using expanded car facilities at Hobart yard which were initiated by the opening of a tank car cleaning plant about a year before. The latest additions consist of the freight car repair and cleaning facilities described in this article. The combined plant consists of a 66-ft. by 361-ft. car-repair shed and associated shop buildings, erected in conjunction with 16 tracks aggregating 15,940 ft. These include five tracks allocated to car repairs, nine tracks to washing and cleaning freight cars, and two tracks especially equipped for cleaning tank-car tanks.

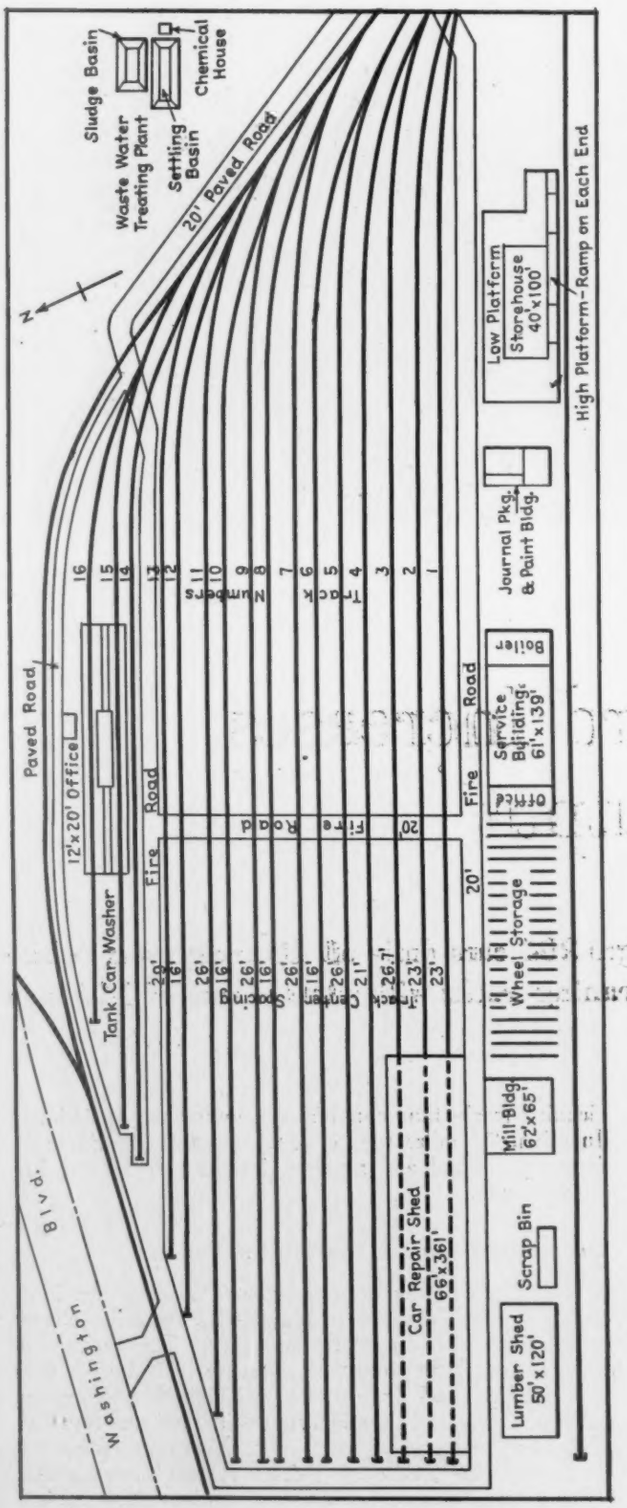
The track capacities of the various units are as follows: 18 cars under the repair shed, 82 cars on outside repair tracks, 164 cars on outside cleaning tracks and 10 cars at the tank-car cleaning station. By way of comparison, this is 58 more cars on repair tracks and 65 more cars on cleaning tracks than could be accommodated at Redondo Junction, 2.3 miles west of Hobart, where the Santa Fe formerly cleaned and repaired freight cars for the Los Angeles area.

### Over 4,000 Cars a Month Handled

The output of the present Hobart Yard for the four-month period, February to May, 1952, inclusive, shown in the table, tells an interesting story. The production figures show, for example, an increase in bad-order cars repaired from 705 in February to 855 in May when the daily average was 40 cars. Automobile-rack cars repaired and reworked decreased from 732 in February to about 500 for the balance of the period and averaged 27 cars a day.

The tank-car cleaning tracks and equipment were used

General arrangement of Santa Fe car repair and cleaning tracks, with associated facilities, which are located at Hobart (Los Angeles) Cal.




to clean an average of 122 cars a month, or six cars each working day. Other freight cars cleaned and classified varied somewhat in number during the period, but exceeded 3,000 on two of the months and averaged 135 a day. The grand total of cars repaired, cleaned and classified at Hobart Yard dropped below 4,000 during only one month of this period in which the average output was 204 cars a day reconditioned and turned over to the operating department for further revenue service.

The total repair track force required for this production varied somewhat from month to month, but included on the average about 82 carmen, 2 painters, 3 welders, 5 miscellaneous mechanics, 10 carman helpers, 9 oilers and repackers, 31 laborers and two tractor operators; total, 144. This is exclusive of supervision and office employees, also one helper and two laborers in the small but well-organized and equipped stores department.

## General Description of Facilities

The repair track layout extends in a general east-west direction with the car repair shed located at the west end, covering three tracks and holding six cars per track or a total of 18 cars. There is no traveling crane in this shed but it gives overhead protection when necessary for some of the heavier car repair work which must be done at Hobart Yard.

Other shop facilities beginning at the west end include a 60-ft. by 120-ft. lumber shed; a convenient scrap bin; 62-ft. by 65-ft. wood mill car-wheel-storage space having 19 double tracks and a 3-ton, 16-ft. radius full-revolving jib crane; 61-ft. by 170-ft. service building with office in one end and boiler room in the other; small 30-ft. by 60-ft. building to accommodate both the journal packing and paint supply rooms; 40-ft. by 100-ft. storehouse with surrounding low concrete platform, except at the track material delivery side where a high platform is reached by a ramp on either end; gasoline unloading crane and 12,000-gal. underground gasoline tank at the east end.

The 16 repair and cleaning tracks are spaced in general on alternate 16-ft. and 26-ft. centers to conserve space and yet provide ample room for movement of trucks, tractors and materials along at least one side of each track. Tracks 1, 2 and 3 have uniform 23-ft. center spacing and there is a 29-ft. space including a fire road between Tracks 13 and 14.

The entire track area is concreted and effectively drained so that it can be kept clean and dry at all times. In fact, an outstanding impression of this yard is its good order, cleanliness and ability to do a thorough job of reconditioning freight cars in minimum time.

Continuous concrete jacking blocks, 600 ft. in length are provided along each side of Track 1, east of the 20-ft fire road across the yard, and all wheel changes ar therefore made on this section of track. All tracks i the yard except Nos. 15 and 16 are equipped with 2-in. ai lines and suitable outlets at 80-ft. intervals. Even-num bered tracks have 2-in. water lines, in addition, for ca washing and these outlets also are spaced 80 ft. apart.

Water is carried across the yard in a 6-in. cast iron underground pipe; air in a new 4-in. overhead air line; and steam to the tank-car washer in a 3-in. overhead steamline. In connection with the tank-car washer, an extensive waste-water treating plant is installed, consisting primarily of a chemical house, settling basin and sludge basin.

Special equipment in the power house includes two 150-lb. oil-fired steam boilers, three air compressors, one fire pump of 1,000 g.p.m. capacity and two booster pumps, and one water softener. The service building

Mill room and car-repair shed, with wheel storage tracks in the foreground.

The car repair shed will hold six bad-order cars on each of three tracks.

The nerve center of Hobart Yard freight-car reconditioning work.

also houses a small blacksmith shop, air room, machine and welding shops, and a locker room. The blacksmith shop has a 1-ton air hoist, two steam hammers, one air hammer, coke forge and gas forge. The air room is equipped with a metal work bench, tanks for cleaning air brake pistons and all special tools and test equipment needed.

The machine shop has a ½-ton air hoist, one large drill press, one electric-driven pipe and bolt threader, one small drill press, one 14-in. dry grinder with dust collector; a rack and bench to repair Preco fan floor and drive assemblies. The welding shop has four welding booths; one 400-amp. electric arc welding machine; one 1-ton air hoist; one 24-in. dry grinder with dust collector; one receptacle to catch sparks and slag when using acetylene torch to keep slag off the cement floor. The locker room is equipped with 50 wash basins and has space for 200 lockers.

The mill room has one joiner, one planer, one cut-off saw, two rip saws, one wood boring machine, one dry grinder and one wet grinder. The sheetmetal shop is equipped with a power brake, squaring shears, small shears, roller, crimper and various sizes of tinner's stands, small snips, punches and stencils.

The oil house has 22 soaking vats, two oil pumps and ample storage room for new packing. The other part of this building is occupied by the paint shop equipped with various sizes of spray guns and convenient means for distributing paints as needed.

The paint shop, air room, machine shop and office are equipped with fluorescent lights. The blacksmith shop, welding shop, air room, machine shop and locker rooms have overhead heating systems controlled with electric thermostats. Electric drinking fountains are located at convenient places about the yards and shop buildings.

## Portable Equipment Featured

Every effort is made to reduce manual labor, especially in handling materials. Portable equipment located at Hobart Yard, includes one International three-ton truck equipped with jacks, blocks, air winch, chain block, acetylene torch and all material and tools needed to repair cars set out on the line. There is also one Dodge 1½-ton truck equipped with small crane, chain block, tools and equipment needed to repair cars at industries.

Other equipment designed more specifically for use in Hobart car repair work, includes a Krane Car with 18-ft. boom for unloading heavy materials such as car wheels; one portable 300-amp. electric welder; one portable 400-amp. electric welder; one P. & H. self-propelled gasoline-driven 400-amp. electric welder; two shop tractors; one lift truck used primarily for moving wheels to and from cars; two Buda chore boys; six A-frames equipped with chain hoists and used in changing car wheels; one gasoline-operated device for testing Preco fans on refrigerator cars.

## How the Yard Is Operated

In general, Tracks 1, 2 and 3 are used for repairing bad-order cars at Hobart Yard, Tracks 4 and 5 for reworking auto-rack cars and Tracks 7 to 14 for cars which require only cleaning and classification. In the latter category, refrigerator cars are handled mostly on Tracks 11, 12 and 13 and covered hoppers on Track 14. Tank cars which are OK mechanically but need to be cleaned for other liquid commodity loading go through the tank washing plant on Tracks 15 and 16.

There is little new about the kind of repair work done to cars on the first three tracks, or the way it is handled, except that tools, power jacks, horses and all materials are easily available for the prompt repair or replacement of car wheels, truck parts, couplers, draft gears, air brake and car body parts. Bad-order empty cars are set on these tracks, usually during the third shift, and pulled once a day when repair work is completed. Any cars requiring repairs which seem likely to take more than one day are switched to the stub-ends of tracks under the shed where they will not prevent pulling other cars as soon as they are repaired and ready for service. Loaded cars which develop defects or shifted loads are taken care of in the usual manner on Tracks 1, 2 and 3 at Hobart Yard.

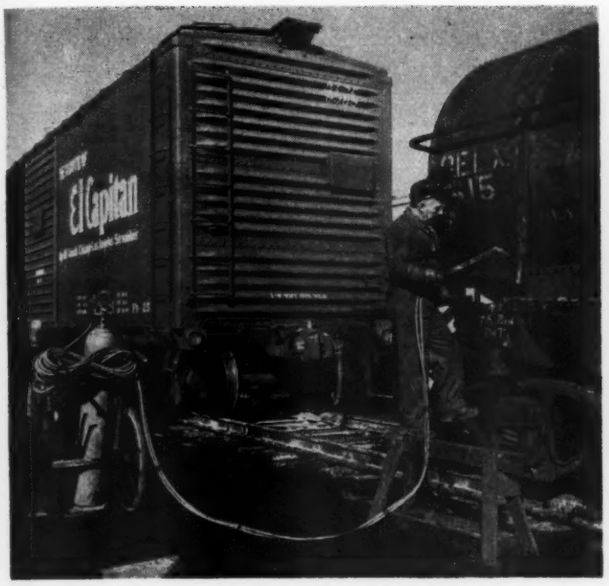
In addition to checking car bodies and running gear, the special attention given to auto-rack cars on Tracks 4 and 5 consists of close inspection of all hoisting and hold-down parts including chains and turnbuckles, which are replaced if worn and otherwise put in condition to hold automobile loads securely in place while being shipped by rail. Any necessary cleaning of bad-order and auto rack cars is done while they are on Tracks 1 to 5 in order to avoid an extra switching movement.

The freight-car cleaning operations on Tracks 6 to 14, incl., are well organized to save both time and labor. In general, the cars are first thoroughly swept out, all dirt

**OUTPUT AT THE SANTA FE's HOBART CAR REPAIR YARD DURING FOUR MONTHS OF 1952**

| | February | March | April | May | Average for four months |
|---|---|---|---|---|---|
| Bad-order cars repaired | 705 | 776 | 815 | 855 | 788 |
| Daily average | 35 | 37 | 37 | 40 | 37 |
| Auto-rack cars worked | 732 | 480 | 498 | 513 | 556 |
| Daily average | 36 | 23 | 22 | 24 | 27 |
| Tank cars cleaned | 135 | 104 | 122 | 126 | 122 |
| Daily average | 7 | 5 | 6 | 6 | 6 |
| Cars cleaned and classified only | 3,063 | 2,557 | 3,007 | 2,685 | 2,828 |
| Daily average | 153 | 122 | 136 | 128 | 135 |
| Total cars cleaned and classified* | 4,635 | 3,882 | 4,442 | 4,179 | 4,284 |
| Daily average | 232 | 185 | 202 | 199 | 204 |

* Includes bad-order cars, auto racks, and tanks cleaned as all cars not loaded are classified.




Repairing a broken tank band with portable gas-welding equipment.

Changing out a pair of defective car wheels with jacks, blocking and A-frame.

and rubbish being shoveled directly from the cars to dump trucks operated under contract and scheduled to pass up or down each track generally once a day. By spotting the trucks close to house-car door ways, refuse can be quickly and easily disposed of without getting on the ground at all.

Normally, the cars are either blown out with compressed air, or, if necessary, flushed out with a powerful stream of cold water through hose connection from the nearest available water pipe outlet. Oil spots are covered with a sealer, applied with a spray gun, and other cleaning methods are used as required. A careful inspection is made for evidences of insect infestation and in some cases it is found necessary to fumigate the cars.

Covered hopper cars receive special attention in cleaning because loaded materials in so many instances are of such a character that any traces left in interior crevices or depressions will contaminate and seriously damage subsequent loads. All inside walls, slope sheets and hoppers are therefore thoroughly flushed out with clear water and carefully examined with a flashlight to see that all remains of the previous load have been removed. In some instances, after drying, the bottom hopper doors are paper lined to prevent any leakage of finely pulverized, flour-like materials, such as Filtrol powdered clay, used extensively in petroleum refineries.

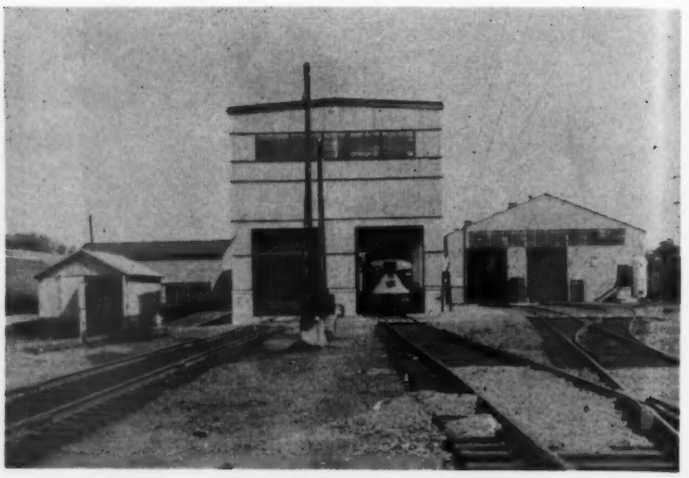
Similarly, all refrigerator cars get extra attention in cleaning, floor racks being lifted for thorough sweeping and washing the floor when the side walls and bulkheads are flushed. Ice bunkers are cleared of ice, salt and accumulated trash; then being washed out. When previous loads of fish or any other commodity leave objectionable odors in cars after the first washing, they are washed again with a caustic solution and, in extreme cases, may have to be sent to the back shop for heavy rebuilding.

The tank car cleaning on Tracks 15 and 16 is a highly specialized operation requiring special equipment and methods which can be adequately covered only in a separate article. Cars are moved up to and through the tank car washing machine with a Chicago Pneumatic air winch of 2,000 lb. capacity.

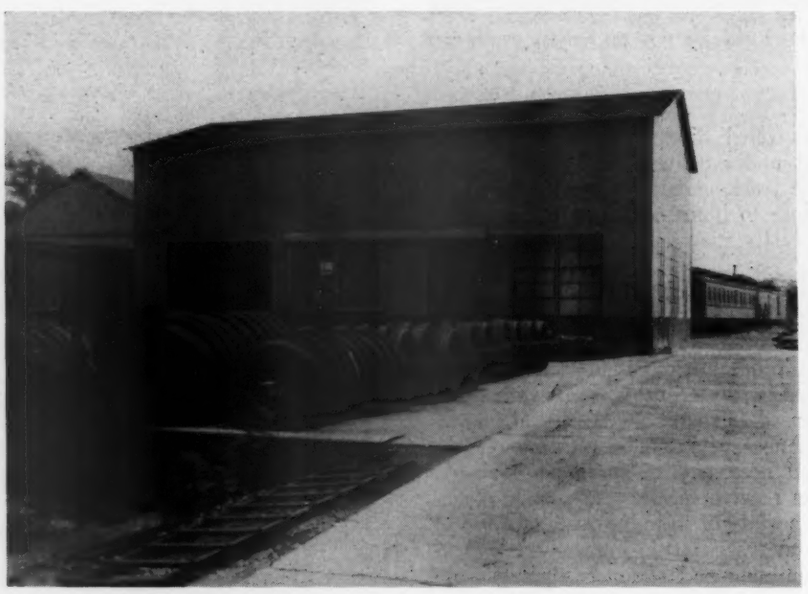
Freight cars of various types are sent to the Hobart Yard for reconditioning in accordance with traffic demands and generally switched to the various tracks during the third shift, as stated. The repaired, cleaned and classified cars are pulled once a day, except in the case of refrigerator cars or other special cars in great demand, in which case the tracks may be pulled twice a day.

How revolving Oakite spray unit is supported while being lowered into a tank which needs cleaning.

# One Building Houses Car and Diesel Shop



The low bay section on the right handles diesel servicing in the near half and heavy repairs to freight cars in the far half



All car wheel work except turning is handled in this small wheel-shop building.

Since the facilities for maintaining the motive power and rolling stock of the Ann Arbor Railroad were originally built at Owosso, Mich., two major changes have taken place which have confronted the road with a problem common to all roads in the process of dieselization. That problem is having more building space than is required to maintain the diesel fleet. but little or none of it in the right place nor with the right characteristics.

The Ann Arbor solved its problem in a manner different from that used by other roads. The reason it could, and did, employ a somewhat novel solution was based on the result of the aforementioned two major changes which took place on the line. The two changes were the gradual abandonment of passenger service and complete dieselization of all operations.

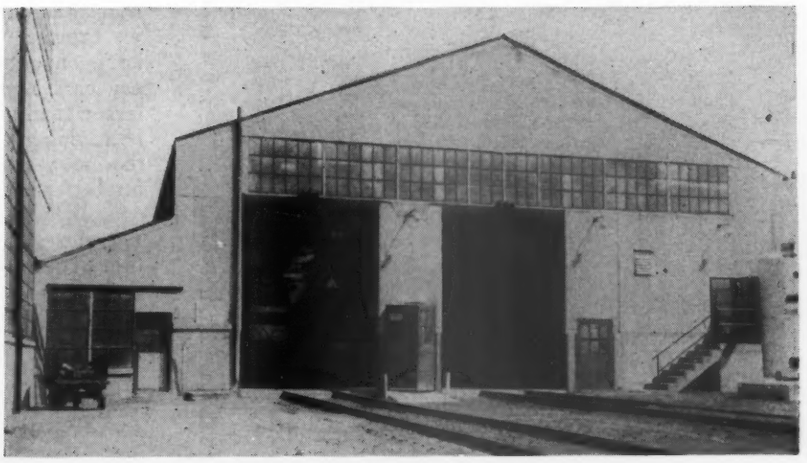
The situation was further affected by the rapidity of dieselization. Prior to December 1950 the entire roster was composed of steam power with the sole exception of one 44-ton Whitcomb switcher. In that single month the line switched over to complete diesel operation with delivery from Alco of fourteen 1,600-hp. road freight A-units, two 1,000-hp. switchers and six 660-hp. switching locomotives. This quick changeover from nearly 100 per cent steam operation to full dieselization avoided a troublesome drawn-out transition period, but it did require fast work in readying maintenance facilities for the new power.

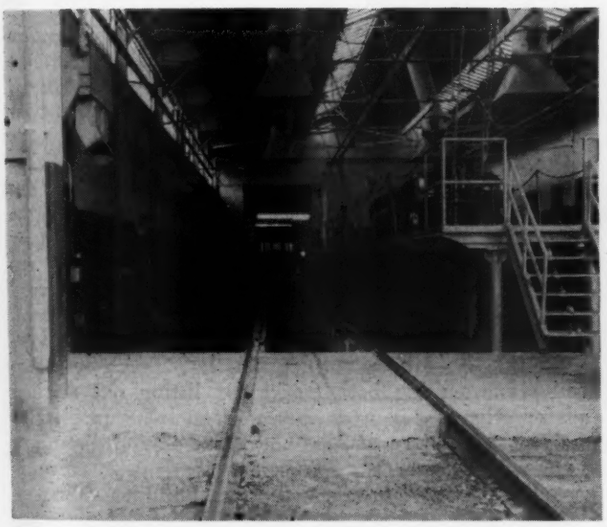
There were three principal buildings available—the old steam engine house, the backshop and a freight car heavy repair shop. The latter was a building 300 ft. long and from 64 to 80 ft. wide. Three tracks at ground level extended into this building from the rip track and terminated at the far end. To one corner of this building was attached a large wood mill.

Neither the engine house nor the steam backshop was well suited to either diesel repairs or general freight car repairs. The freight car shop, on the other hand, was quite adequate for continuing freight car heavy repairs without any change, or it could be converted to a diesel repair shop without undue expense because of its size, shape and location.

The freight car shop, like the roundhouse and the back

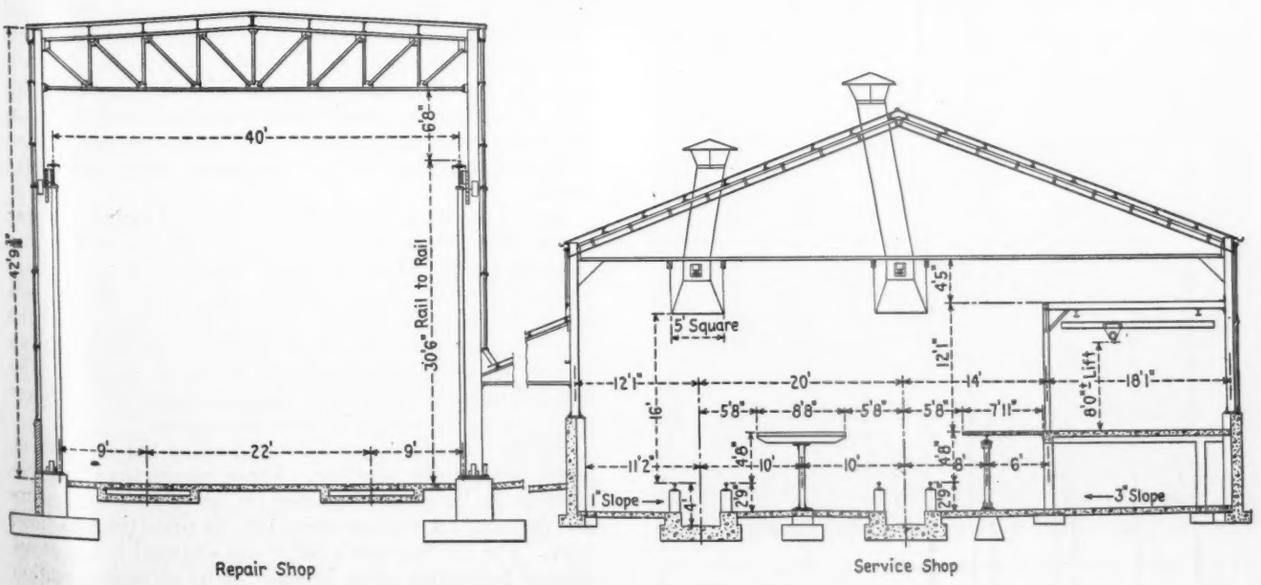
The small lights over the doors show if the door is raised enough to clear a locomotive—green if yes, red if no.





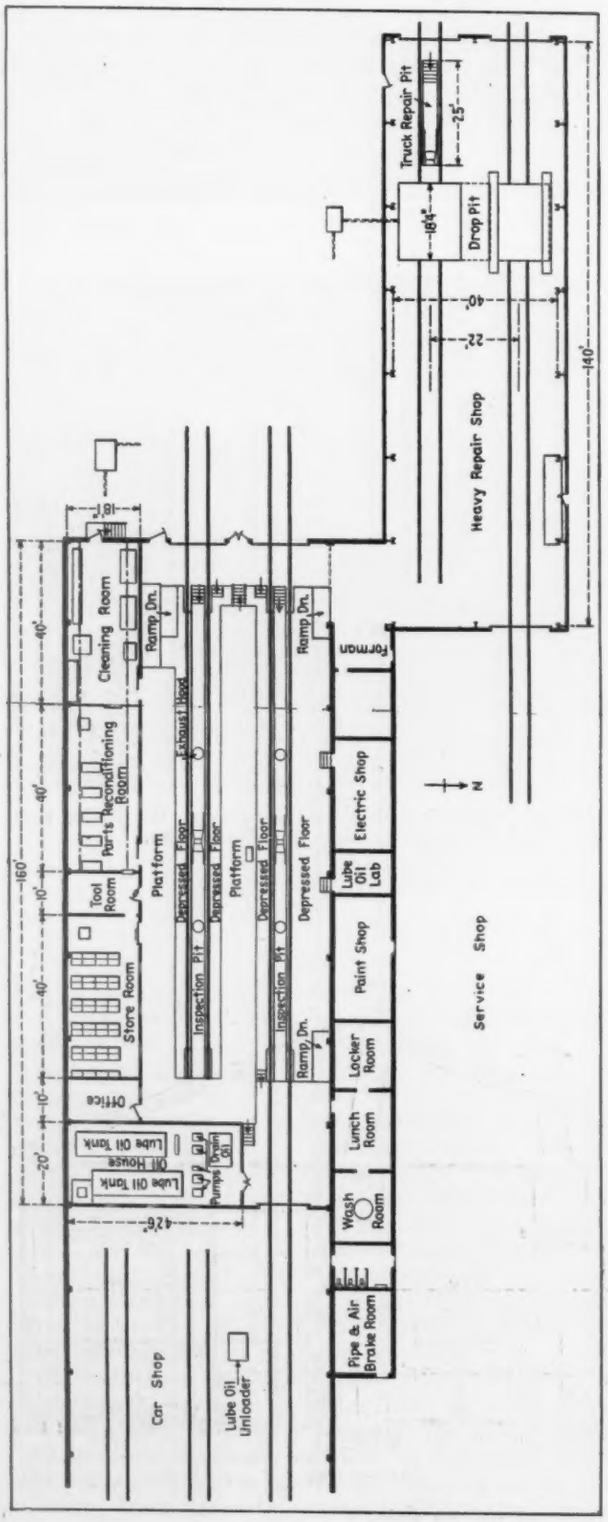
The diesel side has two tracks; the car side has three. One of the tracks extends through from one shop to the other.

The right platform leads to the diesel storeroom, the cleaning room, the parts repair room, a tool room and a small office.




Cross-sections through the diesel repair and high-bay shops.

Floor plan of the combination car and diesel shop of the Ann Arbor at Owosso, Mich.




shop, was built during the days when the Ann Arbor ran an extensive passenger service. It was therefore built large enough to accommodate both freight and passenger cars undergoing general repairs. It was therefore larger than needed to handle freight cars only, as it has been doing since discontinuing passenger service. Furthermore, the average freight car in service today is a far better car than what was used twenty or thirty years ago. It is better designed and requires less maintenance. Therefore, less shop space is needed to maintain today's fleet of Ann Arbor freight cars than was needed to maintain the cars that were operated at the time the large car shop was built.

## Wall Divides Building in Two Sections

The existing car shop building was therefore divided approximately in two by a wall. Half of it is now used for car repairs, and half for diesel servicing. The latter is used in conjunction with a high-bay section built onto one corner of the diesel section where the wood mill was formerly located.

The three tracks in the original car shop were left in place in the car section, but two were terminated at the dividing wall. The third extends through to the diesel side, where an automatically operated overhead steel door closes off the opening between the two portions.

The diesel side of the building is 160 ft. long and has the aforementioned track that extends through to the car side. It also has a second track, located in line with the center track of the car section but separated from it by the dividing wall. Both tracks in the diesel section are served by locomotive-floor-level platforms, have depressed floors, lighted pits, etc., in the customary arrangement.

The high-bay portion built onto the corner of the low-bay section is 44 ft. by 140 ft., has two tracks, an overhead crane serving both tracks for lifting out engines and for other heavy work, and a drop table capable of handling four-wheel trucks and fitted for dropping a single pair of wheels. The general foreman's office is located in the corner where the two buildings join.

Rooms for cleaning and repairing individual parts are located along one side of the diesel house at platform level. The rooms now occupy the area where the removed section of the third car track formerly laid, although on the level of the locomotive floor platform rather than track level. The area under these rooms—the diesel storeroom, the toolroom, the parts repair room, the cleaning room and an office on the end of this series of rooms near the dividing wall—was not filled in. Instead, this area is used for under-platform storage of such things as the transition-testing motor-generator set, a snow melter, a battery charger, and miscellaneous large and heavy items.

One of the innovations of this shop is a square opening in the floor of the parts repair room and one in the filter cleaning room. These openings are about a yard square and are normally closed with a steel cover. When parts are to be moved between either of these rooms and the lower storage area, the cover is merely raised as shown in one of the illustrations and parts or stores can be handled quickly and directly between them and the lower storage area by cranes in these two rooms.

Another row of rooms is located along the opposite, or north, side of the building. These rooms were incorporated in the building when used exclusively for car repairs and required minor conversion only to adapt them to diesel work. The car foreman's office was changed to the diesel general foreman's office because of its strategic location between the high and the low bay sections; the water

engineer's laboratory was converted to a lube oil lab; the electric shop was left essentially as it was for overhauling small electrical parts off diesel locomotives; the wash and locker rooms were unchanged; the upholstery shop was converted to a locker room; and the car department paint shop was left as it was.

Overhead steel doors raised and lowered by electric-motor drive are installed at the two entrances to the low bay section and the two entrances to the high bay section of the diesel shop, as well as to the three entrances of the freight car shop. The two doors leading into the low bay section have a red and green light mounted over them to indicate to the hostler when the door has been raised high enough to permit a locomotive to enter. The light is green when the door is opened far enough to clear a locomotive, red when it is not.

Complete overhaul work is done on the diesel engines and on the locomotive trucks. Minor body work and electrical work are done; unit exchange is used on all parts requiring extensive electrical repairs. On the freight car end, heavy repairs only are made within the shop. The rip track is directly outside the car section and all light and running repairs are made outdoors.

## Other Buildings Are Still Used

Both the diesel and the car facilities in this building depend to some extent on other repair areas at Owosso. The former steam backshop has not been torn down, nor has much of the machinery been moved. Instead it is used for such operations as turning all mounted car and diesel locomotive wheels, for mounting and demounting diesel locomotive wheels and for miscellaneous machine work that becomes necessary on either car or locomotive parts. This building, in addition to its car and locomotive shop operations, maintains all the track motor cars on the Ann Arbor, and it handles some of the heavy repair work for the marine department.

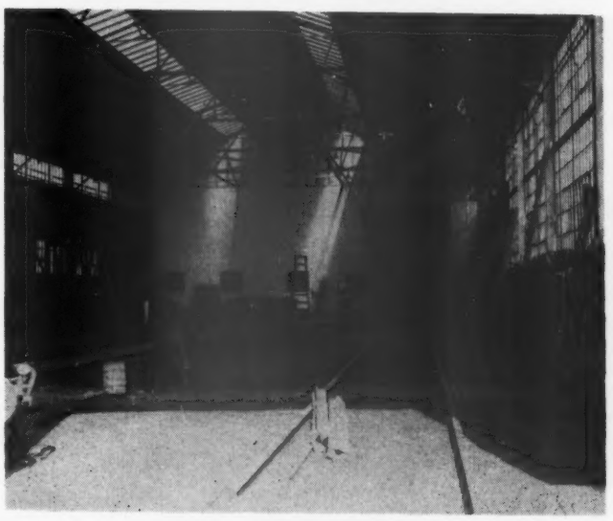
The wheel shop for the car department is likewise in a separate building. This is a small steel building with a concrete floor surrounded by a concrete storage area for both mounted and single wheels. The building itself houses equipment for boring wheels, turning journals and wheel seats, mounting and demounting wheels, etc.

Removal of diesel fumes from the low bay area is accomplished by two exhaust ducts with motor-driven fans over each of the two tracks. Each duct is offset along its length as it rises towards the roof to clear structural members of the building. Rain is prevented from entering the building through the ducts by a cover mounted several inches above the top of the duct and extending a few inches beyond the duct along the entire circumference. Each duct is supported by the steel framing of the building through intermediate supports of wood to dampen vibrations and noise.

Better ventilation for workers inside a locomotive is attained by portable exhaust fans which hook to the door opening of road units. These fans are each driven by 1-hp. motor, and are shown in one of the illustrations.

Great care is exercised in testing the oil on all Ann Arbor diesel locomotives. On road freight and road switcher locomotives, for example, the oil is tested each time the locomotive passes through Owosso, usually about once each day. The policy has been quite successful in operation; the road has never had any crankshaft trouble. The laboratory is located in the same building as the diesel shop, thus making it convenient to take the samples from the locomotives that come through. It is along the north side in what was formerly the water engineer's laboratory.

The high bay section has a travelling crane for heavy parts and a drop table for four-wheel trucks



The freight car section from the rip track, looking toward the wall dividing the car and diesel sections.

One corner of the wheel shop showing a new wheel borer and the mounting press.

The lathe for boring the liners. The counterweight arrangement keeps the boring bar in contact with the template.

# How Southern Reconditions Diesel Cylinder Liners

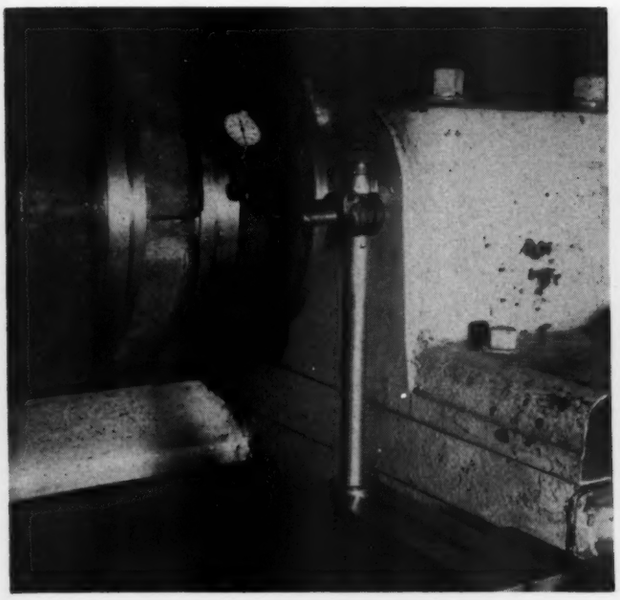
THE Southern Railway follows the practice of machining and honing all diesel cylinder liners during reconditioning. At the Pegram shops in Atlanta, Ga., the total floor-to-floor time for the operation, including all inspection, takes about 1¾ hr. Machining is done on a conventional engine lathe especially equipped for aligning the liner and for making the tool follow the template. A standard honing machine is used with a special air clamp which reduces the time required to set up the liner and, by means of the limited force with which it holds the liner, functions as a safety device. If the honing pressure becomes excessive, the liner slips and turns in the clamp. The engine lathe-hone combination handles all liners for over 600 diesel units.

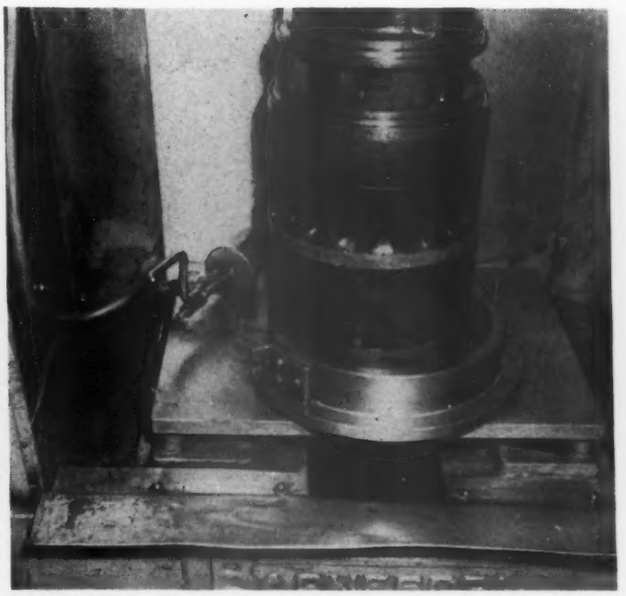
Lining up the cylinder for the machining operation is quick and simple. A valve bushing has been bolted to the face plate of the lathe with cap screws. The cylinder studs fit through the face plate, and nuts secure the liner to the valve bushing. As the top and top face of the liner are machined surfaces, the end of the liner near the face plate, or the top, will run true. The bottom of the liner is aligned to run true by tightening up on the stud nuts. A surface dial gauge mounted on the lathe carriage checks the trueness of the running of the liner. The pointer on the dial gage contacts the bottom seat seal which has been cleaned up for this purpose.

Normally one pass of the cutting tool is sufficient. Carbide tools are used with a .004-in. feed at a speed of 200 r.p.m. If more than 0.20 in. need be removed, a second cut is taken, but it is seldom that cuts of this amount are necessary A special forming tool is used for chamfering the bottom of the liner. The top end is chamfering the bottom of the liner. The top end is chamfered fered by the boring tool. This latter chamfer and the center relief groove, or "Mae West", is put in by the boring bar which follows the template for the complete boring operation. The boring bar is caused to follow this template by two weights attached to the boring bar housing through a chain and sprocket to hold it against the template.

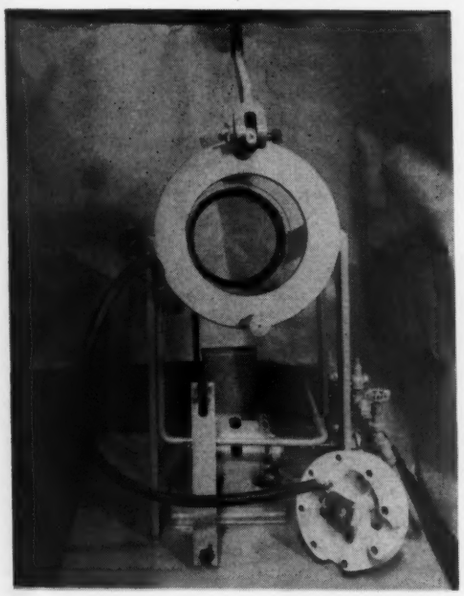
Liners are finished to either one of two overside step sizes, .030 in. or .060 in. They are bored out to .029 or to .059 in. oversize on the lathe, and the final .001 in. is removed with the hone. The machining time requires about one hour and the honing time about 10 to 12 min. The floor to floor time for honing is about 15 min. Cutting oil for the honing operation is a mixture of about 2/3 kerosene and 1/3 standard cutting oil. Dust and shavings from the machine operation are removed by a vacuum tube mounted on the boring bar.

The air clamp on the honing machine is of the hinged split-ring design and is operated by an air cylinder 3 in. in diameter with a 4-in. stroke on about 60-lb. air pressure. The piston has a direct contact to the ring, with





A dial gage (left) is used to align the bottom of the liner to run true. The liner (right) is held in the honing machine by an air clamp which is quickly secured and which protects the liner against excessive honing pressure.



Drum and dummy head used for testing cylinder liners after machining at 100-lb. pressure.

Remachined cylinder liner being tested for water tightness.

the end of the piston rod threaded for moving a stop which accommodates different size liners.

The seat in the bushing which is attached to the lathe face plate is refaced about once every six months. Other maintenance required on the machine is checking twice a week with a surface gage to make sure that the boring bar runs straight. The seat seals on the liner are checked with a pair of "go" gages.

At the Pegram shops a test stand with a dummy head is used for testing Diesel cylinder liners prior to application to the engine. Cold water at 100 lb. per sq. in. is used for testing liners after re-machining.

The jacket assembly fits into a drum fitted with a vent valve on top to exhaust the displaced air. The water jacket is filled from the city water line, after which the 100-lb. pressure is built up by a 3-g.p.m. electric-motor-driven pump. A check valve incorporated in the piping closes off the pump delivery line and the jacket inlet line from the city line to permit the pressure to be built up. The top of the jacket is closed off by a soft rubber gasket and a 3-in. dummy head. The dummy head has a partial-circular section of steel 3 in. long with a 1½-in. radius welded to the center. This piece mates with a cam on the handle to lock the dummy head tightly in place.

The drum into which the liner assembly fits is supported on two sets of uprights. One pair is ¾ in. by 3½ in. by 34 in. The second pair is ¾ in. by 3 in. by 32 in. The two pairs are 13½ in. apart on centers and support the drum at an angle of about 15 deg. Both pairs are welded to a base plate ⅜ in. by 40 in. by 40 in. The drum has an outside diameter of 18½ in., is made from ⅜-in. boiler plate, and is of all-welded construction. The lower head has a double seat as in the engine cylinder and is sealed by regular service gaskets.

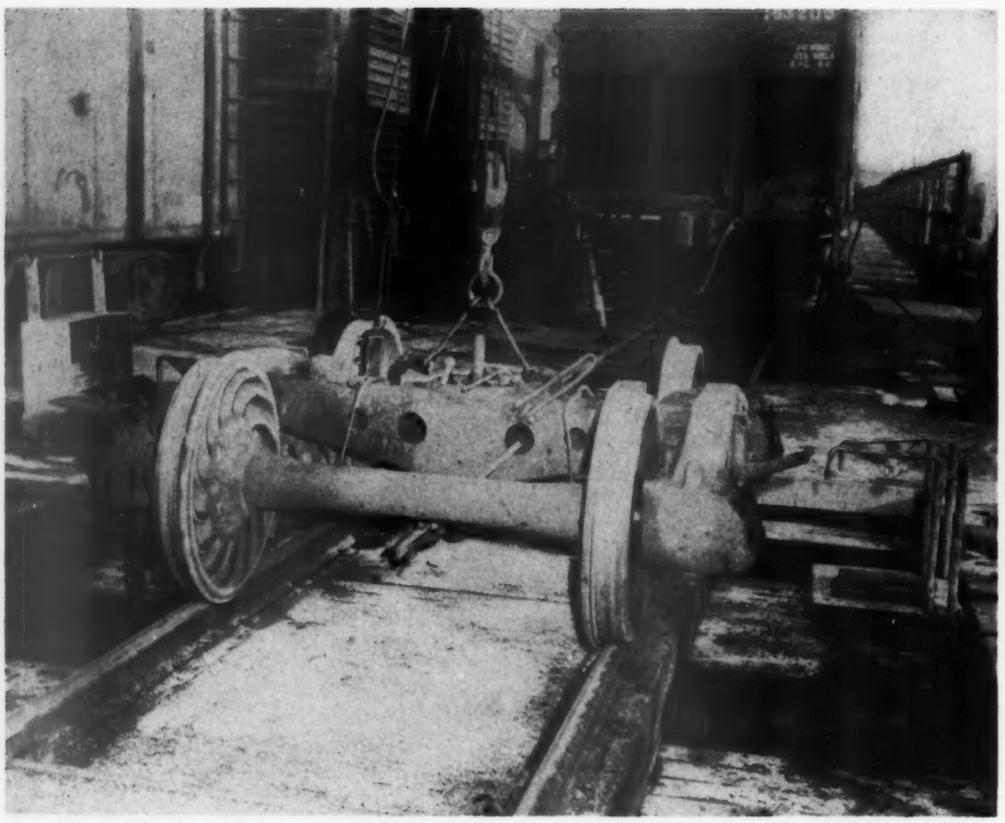


Fig. 1 — A dolly ready to be moved into position for supporting the side frame on the right.

Fig. 2 — How the dollies support the side frames for movement to the pit sides and overhaul.

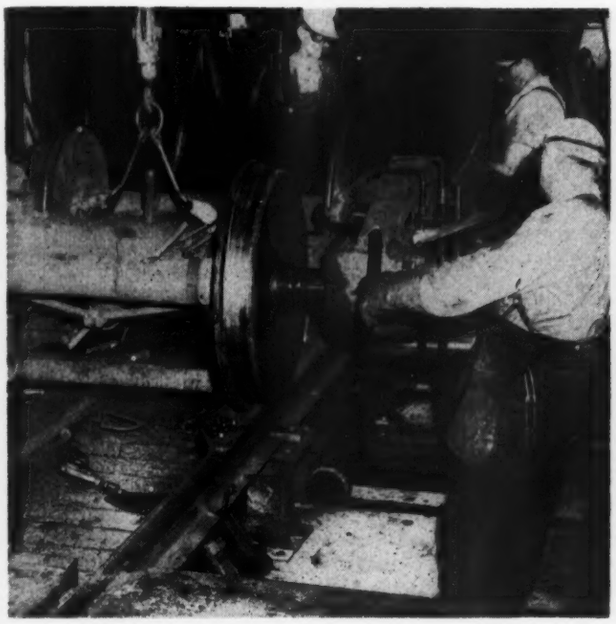


Fig. 3—With the side frame securely supported by the dolly, it is moved by hand to the recess in the side of the pit.

Fig. 4—With the dolly supporting the side frame in the recess, the boxes can be cleaned without interfering with other work.

# Indoor and Outdoor Pits for Truck Repairs

**Two types of pits designed for specific operations are equipped with facilities to suit those operations**

The Louisville & Nashville has constructed pits at its South Louisville shops for making complete inspection and repairs at a single location to freight car trucks, couplers and draft gears. The pits are installed at two points. One is on the rip track and is served by an overhead monorail crane. Four are within the heavy repair shop.

By concentrating all work on each truck and its associated parts at a single pit, unnecessary steps are avoided, and tools and materials are within easy reach. Furthermore, one foreman can easily supervise all work and material under his jurisdiction. The truck pits enable the railroad to save approximately 80 mechanic hours per day on the heavy repair tracks as compared to the old method of truck repairs wherein the work was handled at several locations in the shop.

The pits themselves are essentially the same at both the inside and the outside locations. Both groups are served by overhead electric cranes, have the same dimensions, and are similar in layout and equipment. The pits are 16 ft. long by 13 ft. wide, exclusive of a recess on each side for a dolly that holds the side frame.

In each case the truck pits comprise a pair of rails at the ground or floor level and a depressed area on either side of the rails. The depressed area is 1 ft. 10 in. below the top of the rail, and is 4 ft. wide by 16 ft. long. One of the few differences between the outside and the inside pits is that the area between the rails is filled in on the outside whereas it is depressed 1 ft. 10 in. on the inside pit, the same as the area on the sides of the rail. The only other difference of any consequence between the indoor and the outdoor pits is that the indoor pits have individual racks along the outer edges for storing tools and small replacement parts.

All the pits have four-wheel dollies, two to each pit, which run on a pair of narrow gage rails perpendicular to the main track (Fig. 1). The dollies support the side frame after the bolster has been lifted by the crane (Fig. 2). They have a platform which slips underneath the truck side frame to remove it clear of the truck working area, and a pair of uprights with a hook top to secure the side frame to the dolly for the movement.

The indention in the sides in which the dolly and the side frame are stored during truck overhaul is 2 ft. wide and 3 ft. long. When the dolly is wheeled back to the extreme edge of this indention it and the side frame are completely out of the way (Fig. 4). No crane is tied up in the movement and the need for finding a place to store

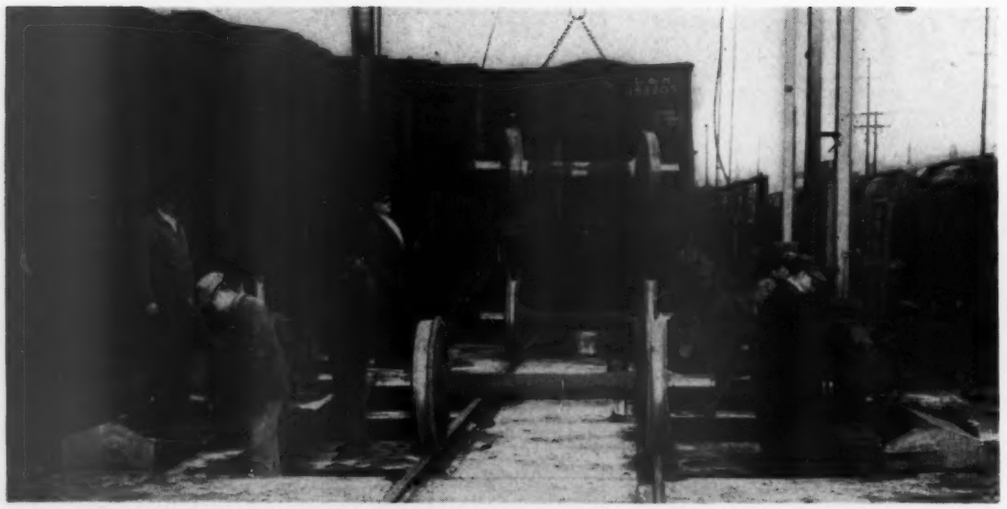


Fig. 5 — Tools and materials are close at hand for cleaning and overhauling components of the dismantled truck.

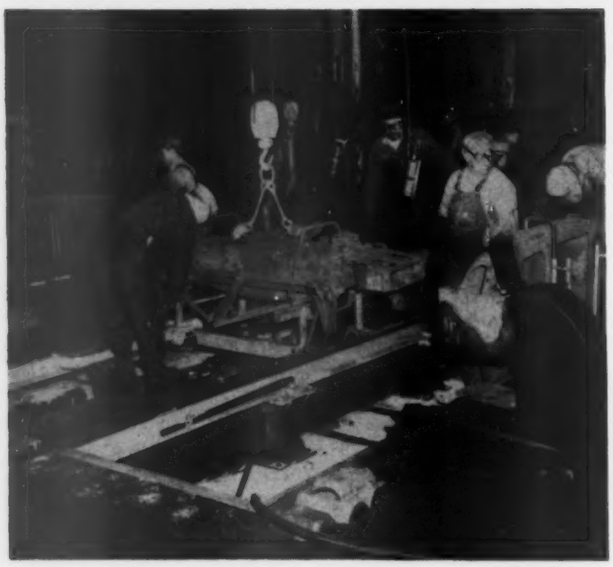


Fig. 6—With the dollies holding the side frames in recesses the journal-box refuse is caught in the metal container at the right.

the side frame is eliminated. At the same time the side frame is supported securely at a comfortable working height with ample surrounding working space for renewing the dust guards, cleaning out the journal boxes and any other work required on it.

The inside pits are equipped with lightweight metal containers (Fig. 6) which fit up snugly against the journal box opening on the outside to collect the dirt and refuse cleaned out of the box during the overhaul.

Crane facilities differ between the inside and outside pits. Each inside pit is served by two monorails running perpendicular to the shop tracks with a one-tone hoist for handling couplers and a two-ton hoist for lifting and holding the truck bolster. The outdoor crane is a monorail laid out roughly in the shape of a capital letter *P*, with an additional monorail approximately in the center of the loop and perpendicular to the main stem (Fig. 7). The outdoor crane has a two-ton hoist for handling wheels and couplers and a three-ton hoist for the bolster. All cranes, indoor and outdoor, operate on 230 volts d.c. current. A switch was developed where the loop joins the main stem so that the two-ton hoist can travel the loop and rejoin the main stem (Fig. 8).

## Outdoor Pit Operations

So that all frequently used tools and materials will be concentrated in a relatively small area around the pit on the rip track, a wheel car which holds from 18 to 20 mounted wheel sets is spotted near the pit on an adjacent track (Fig. 9). The car is located so that it is served by the overhead monorail crane to eliminate the problem of getting the good wheels to the rip track and the defective wheels from the rip track. The storage car holds the wheel sizes most commonly used. As the car is switched into the storage location it contains all good wheels. As the good wheels are removed from the car the defective wheels which they replace are loaded onto the car. When the car is full of defective wheels it is exchanged for another car having all good wheels.

Wheel sizes that are required only infrequently are stored beyond the wheel car on the same track. The overhead monorail crane extends into the area for storing odd-size wheels.

Storage area alongside the rip track truck pit is provided for center plates, brake beams, truck bolsters, side frames and other materials needed in rip track work. A 10-day supply of all parts is kept on hand. As the storage space is outside the area served by the overhead crane, heavy parts, such as bolsters and side frames, are handled by lift truck to the truck pits.

Cars found with wheels defective at yard inspection have a special red tag marked "wheels" affixed. This red tag tells the switchmen that the car is to be placed on the rip track equipped with the special truck pit. This is an open track on which the operating department switches cars in and out, and on which both empties and loads are worked.

Each car to be worked is spotted by a car puller with the end to be worked placed next to the pit. A sheave on each side of the pit and 25 feet from the edge positions the car for raising the end by pneumatic jacks. Other sheaves are located along the rip track for moving cars greater distances.

Work begins on the truck after it is rolled out in the conventional way with the car end jacked up. The bolster is lifted by the three-ton hoist of the overhead crane while the four-wheel dollies on each side support the side frames for replacing the dust guards, cleaning the

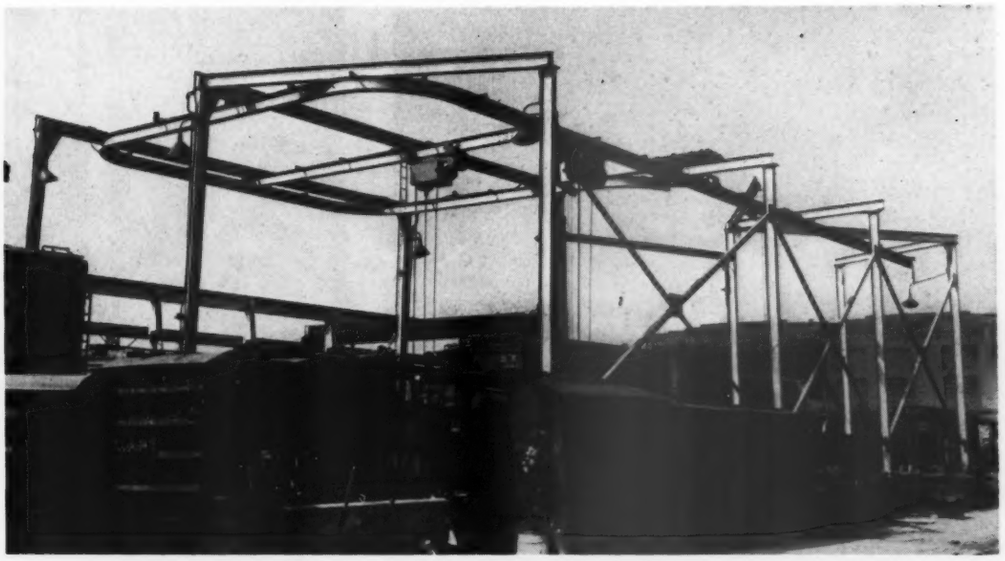


Fig. 7—The monorail crane, with two hoists, which serves the outdoor pit.

boxes and any other work required. The side frames rest on wooden blocks of three different thicknesses to accommodate different designs. The boxes are cleaned by blowing out with air and wiping with dry rags after the heavy grease has been scraped off.

A small metal locker at the outdoor pit holds the tools necessary for removing brasses and for cleaning the brass and wedge, also gages for the wedges. New dust guards, etc., are stored near by. Metal blocks 9 in. by 12 in. by 2½ in. are located at the corners of the pit for sound-testing brasses.

## Pits in the Car Shops

Four pits are installed on two tracks inside the freight car heavy repair shop. The layout of these pits is essentially the same as the outdoor pits. They are, however, somewhat more completely equipped as all trucks are dismantled for repairs which are made to the truck at this

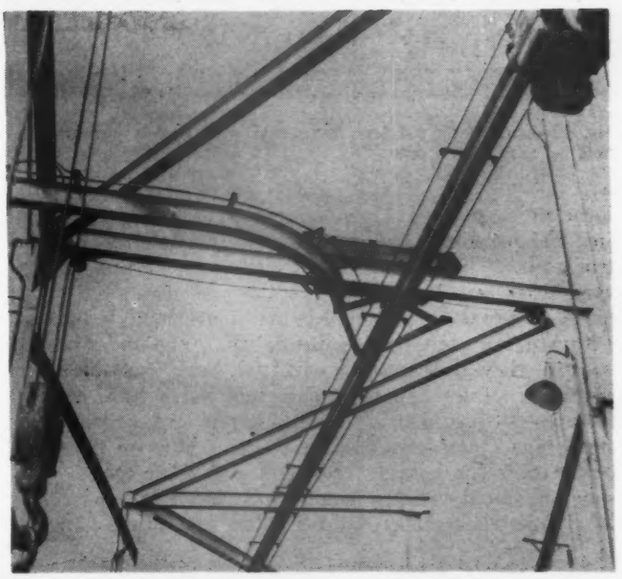


Fig. 8 (right)—Switch arrangement to permit the two-ton hoist to travel around the outdoor loop and rejoin the main stem.

Fig. 9 — The rip track pit with the side-frame storage area and the wheel car on the right.

Fig. 10—Small parts and tools are stored in bins while crowbars are held by clips on the rails.

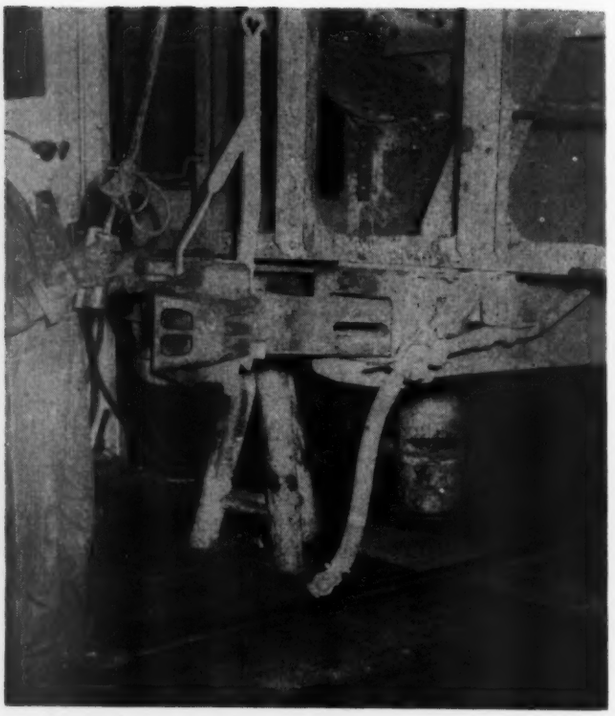


Fig. 11—An auxiliary job done by the indoor truck pit crane is hanging couplers with the aid of this special hook.

location as part of a general car overhaul rather than just the necessary running repairs done on the outside truck pit. The near edges of each pair of pits on the same track are 16 ft. apart.

All material for a complete truck overhaul is located within a few steps of the inside pit. The indoor pits, because they do complete overhaul work and therefore require a steady flow of replacement parts, have certain features not included in the outside pits such as trays for small pins, cotter keys and washers and clips on the sides of the rails for holding crowbars and other tools. The side walls hold springs, dust guards, box lids, plugs, box lid pins, truck shims, bolster shims and brake hangers (Fig. 10). Each of the four pits is also equipped with metal boxes which have openings to mate with the journal box openings to catch the dirt and trash shoved and blown out of the box.

Two devices are used in conjunction with the overhead crane while the car is at the truck pit work location. One is a special hook (Fig. 11) for hanging couplers which is shown in one of the illustrations. The second is a pair of small tongs to put the draft gear and yoke combination on a wagon which is equipped with an air cylinder to raise the draft gear equipment into place. The carrier rests under the draft gear on the wagon (Fig. 12) so that when the gear is raised the bolts can be dropped in.

Fig. 12—Air-cylinder-equipped wagon for applying the draft gear and carrier.

# How to Determine What Diesel Facilities Are Needed*

THE most important problem when providing diesel facilities is careful planning. One railroad which foresaw the extensive use of diesel power in 1947 arranged for a survey to plan for motive power and facility requirements. The first survey covered a five-year period. A year later, in 1948, this developed into a 10-year study and, to date, the roads acquisition of power and facilities has followed this plan with few modifications.

## Facilities for the Smaller Roads

It is true that no one plan could be developed that would fulfill the requirements of all the smaller roads. Each railroad has its own specific problems to meet and incorporate into a master plan. This report will outline the items that must be considered, and give the possible mistakes that can and have been made in the past. For we profit much by past mistakes. We can then in effect, do like a person planning on building a home, examining many different plans, and trying to incorporate into one plan the various ideas best liked or fitted to his needs.

The first thing to consider is the location of the various diesel facilities particularly the one at which the mileage and heavy maintenance work will be performed. In many cases this facility was located at the middle point where the steam power was previously maintained, due to the thought that existing facilities could be converted cheaper than new facilities could be built. In the steam days, power going in a certain direction was cut out at this point and fresh power cut in. All runs through this point being normally through runs, there being no natural lay-overs. In order to get the maintenance on the diesels certain runs have to be cut out and fresh diesels cut in. This takes more diesels in the pool. Suppose that a couple diesels could be eliminated in the pool by locating this facility where natural lay-overs could be utilized for the maintenance period. This money would go a long way towards the cost of a complete new facility. The utilization of the diesells would also be better.

Let's take a specific example: Between Points *A* & *C* we have a number of passenger runs. At Point *A* we have natural layovers of eight hours or more on most of these runs that could be utilized to take care of the maintenance of these passenger diesels. If the maintenance point was located at Point *B* it would be necessary to cut in and out to get the maintenance on these passenger diesels. Result more diesels in the pool, also possible delays due to cut in. Suppose we also have freight runs between Points *AC* and *AD* with natural lay-overs at Point *A*, where all normal maintenance could be performed during these lay-overs. With the maintenance point at *B* cut-ins would be necessary. Result more diesel locomotives in the pool and less utilization of power.

If the decision would be that Point *A* is the desirable place to locate the facility, then several more factors would have to be considered.

1. Does the company own sufficient ground at this point for the facility or if not, could it be secured and at what cost.
2. The man-power question; would it be available? Could the necessary forces be moved from *B* to *A*? What would be the cost to the employees or community?
3. Would it be advisable to perform all mileage maintenance work at Point *A* and still maintain Point *B* for heavy overhauls and repairs or do all the work at Point *A*.

The smaller roads do not have the staff of experts to evaluate all the questions nor can they afford to make a mistake as a larger system might. Therefore the question of location must be considered from all possible angles and given careful consideration, looking into the future as much as humanly possible.

Having made a decision as to location, the next question is the facility itself. If an existing facility is to be converted, then there are certain limits which will govern. If a complete new facility is to be built then there are no limits.

The first thing to consider is the number of diesels to be maintained at this point when completely deiselized. This will govern the size. In many cases they were built too small with no possible way to enlarge later. The plan should include possibility of expansion. It is almost safe to say that most of the existing facilities were found to be 25 per cent too small within the first year after erecting, to efficiently take care of the work. No safety factor was allowed. This also holds true in regard to parts repairs and reclamation space. This usually starts out on a small scale and is gradually increased as experience is gained. There is no limit to which it can be carried. When a part can be repaired cheaper than it can be sent in for unit exchange or repair and return, then the road must take advantage of this fact, for every dollar saved on parts can be utilized for labor. Therefore a program must be worked out as to the extent of repairs and reclamation in the future and space alloted accordingly. The tabulated third section should be a guide for this phase.

The next question is how many units will normally be operated together? Give this serious consideration. For when it is first decided they will be operated as two unit jobs, you will find later that there will be three unit jobs or more, and the possibility that the number of runs will be reduced and the pulling power increased. This will be a factor in the length of the stalls. Facilities are frequently built to handle only two units on a stall for regular maintenance, making necessary parting and assembling units. This takes time and man-hours, of which most of us do not have a surplus. This need not be considered in the heavy repair or overhaul section.

* Abstract of a report presented at Chicago at the September 15-17 meeting of the Locomotive Maintenance Officers' Association by a committee of which H. E. Nikach, superintendent of motive power of the Elgin, Joliet & Eastern was chairman.

Next we will consider what the running repair or mileage maintenance section should consist of.

The depressed floors appear to have a definite advantage. The platform should be built of the T-type construction, if possible. They can be constructed with good head clearance. Lights should be installed in the pits and the under portion of the platform as well as above the platform. The combination of depressed floors, raised tracks, and T type platforms give good visibility, easy access to underneath parts, and make good housekeeping an easy task. Ramps should be built leading to the depressed floors. A pipe line can be run alongside each track with outlets conveniently located, to which short sections of hose can be attached. This pipe line to be run to an underground tank. When necessary to drain lube oil from a diesel a short hose section is connected to the engine lube oil drain and to the pipe line. The oil will flow by gravity to the storage tank. When this tank is full the oil can be pumped out and reclaimed. This same type of system can also be installed to supply lube oil to the diesel from storage tanks, by addition of a suitable pump. Oil can be purchased cheaper in tank car lots than in barrels, with a further dividend in saved man-hours and safety. Water lines, with connections below and above the platform, should be built to supply both cooling system water and steam generator supply tanks. Condensate from a power house can be supplied to a tank and pumped into this system. Air lines should be similarly constructed.

An external plug in system for battery charging is a definite asset.

A drop table should be constructed in one of the stalls, for truck changes.

A filter cleaning room should be constructed on the platform level, with adequate storage space for clean filters. This includes filters of all kinds. A modern semi-automatic air filter cleaning and oiling machine will pay for itself, and do a better job, besides a dividend in cleanliness and safety.

A small work room is also advisable along with a tool crib. These also to be on the platform level.

The question of a guard rail around the platform is open to debate.

Offices if any, should be on the platform level. An adequate record system must be installed so that the history of every diesel part can be recorded.

A paging system operated from the office and platform is a definite asset.

If possible, this section should be a put on and take off section, with all repair work or reclamation done in other sections. This holds true especially if there is a heavy repair section. The air room and tool room sections can be utilized for this class of work.

Proper ventilation, can be costly, yet is very much needed. This has not been completely answered and yet held to a moderate cost. Many methods are being used. With a high ceiling it doesn't cause too much trouble except for the crane operators.

Cranes or other lifting devices should be sufficient to do the work to be performed in this section.

The overall inside construction should be such that it lends itself to good housekeeping, with a minimum of man-hours. Walls and ceiling painted a light reflecting color. The floors should be painted. It should reflect an atmosphere of cleanliness.

Where possible there should be an emergency exit for each stall. This applies in the main to converted facilities.

The heavy repair section is in most cases satisfactorily served by using the erecting shop or heavy overhaul section of the steam days with very few alterations. The crane service is in most cases satisfactory. Portable platforms can and are being used with satisfactory results. A separate room should be constructed for an engine overhaul room. A track can be constructed leading into this room and the engines rolled in and out on a special constructed dolly. It should have monorail over head hoist. Shelves should be constructed to hold part removed and to be applied. A complete set of tools needed for this work can be placed on a board fastened to the walls. The removal of machinery no longer needed will usually give sufficient space for parts repair and reclamation work. Much of this work can be placed in the air room and tool room sections by expanding these sections. These repair or overhaul sections should be divided into small sections with the proper tools and instructions at each section for the work to be performed there. Racks can be easily and cheaply constructed for tearing down and assembling trucks, holding the trucks at a convenient working level. The electrical section will need the most alterations, depending upon the work to be attempted. A dipping tank and drying oven will in most cases be a necessity. Test racks of various kinds will be needed. This department should also be divided into small sections with the proper tools and instructions at each section for the work to be performed.

Where the running repair section is in this same building a store department room carrying the smaller and commonly used parts should be considered.

The usual parts cleaning facilities used in the steam days will in most cases prove satisfactory. It might be necessary to construct a few tanks for small parts.

Load testing is a necessary part of good maintenance. This should be done either in a separate building or means provided to carry away the fumes and dampen the noise.

*Outside Facilities*:—There of necessity must be a turntable or a wye. The wye gives less maintenance problems and can handle more units, but usually takes a little more time for turning. A turntable can be a bottle neck.

There must be proper sand drying facilities and sanding stations. There are some semi-automatic sand drying systems in service that are paying good dividends.

The wash rack should be of concrete, well drained, with facilities for spraying trucks, underframe, and car body. Steam and water must be available. If a washing machine is not needed or considered too costly cheaply constructed car body spray system can be installed.

A fueling station will be needed with a sufficient storage capacity.

Where possible fueling, watering, and sanding should be a one spot operation.

An outside inspection pit may be desirable.

All the outside facilities should be so located that the diesels can be completely serviced on one track leading into the facility.

## Facilities for Larger Railroads

The first, and of course, the foremost consideration would be the operation of the railroad as to its need for strategic placings of shops. This will be left to the discretion of each railroad, as it would be foolish for this committee to attempt to set up a program of placing shop facilities for the different railroads. Every railroad has its different layout; therefore, we shall dwell in generalities as far as shop facilities and the placements are concerned.

The time is now here when some railroads have reached the point of complete deiselization, while the remaining railroads that have not are planning for this in their

diesel facilities. The foundation of our planning for diesel facilities must be based on the words "complete dieselization", for to plan without these two words in mind we would be doing as was done several years ago when turn-around points were made and set up for diesel locomotives. No longer can this type of planning be used for future diesel locomotive maintenance.

There could be three classifications of diesel facilities. The smaller running repair point where a few diesel locomotives are maintained; the second type facility would be the larger maintenance point where a greater number of diesel locomotives are assigned for maintenance; the third type would be the back shop where locomotives are given classified repairs and diesel engines, traction motors, main generators, auxiliary generators, etc., are rebuilt.

The small maintenance shop has to have to a certain extent the same facility as the larger maintenance shop, with the exception that we would not need as large a facility.

The fueling facilities on most railroads are standard in that boiler water, engine water, and fuel are available to be placed on the locomotive at one stop when fuel is being delivered to the locomotive. The swivel type swing-to facility has become the most generally used type fueling facility.

The sanding facilities at the smaller turn-around points are not as elaborate with overhead pipes from one centralized drying unit as at the larger railroad terminals, but many railroads with their own ingenuity have installed their own sanding equipment in that the sand is delivered adequately from overhead tanks in a dry, ready to use condition.

Following the fueling track it is well to plan on adequate cleaning facilities for cleanliness on diesel locomotives is essential. Many pages have been and shall be written concerning cleaning so we shall only say "Make your plans for cleaning," as a clean locomotive is a safe operating locomotive and a better one in the long run, saving the maintenance people much work and the railroad much money.

After we leave the cleaning track, as to whether or not we would cross the turntable would be dependent upon whether this shop had been an old facility converted to diesel locomotive operation or if it were a new facility. The reason for bringing this out is that in many instances where the old facility was used the turntable was necessary but it is the trend throughout the country to favor the run through type shop in building a new facility, eliminating the turntable. The point of the turntable could become controversial as some maintenance points and some railroads do not keep their locomotives permanently coupled, therefore, this is a point for consideration by the railroads involved as to the need of the maintenance point for a turntable.

It is imperative to properly maintain and do a quick job of turning locomotives that the raised platform, depressed pit type shop be used, for this type platform and it enables the workmen to enter in and out of the locomotive, and get underneath and do a better job by making it easier for them to get to the work in a quicker manner.

It is believed even with a small shop such as we are discussing that the often forgotten item of the overhead crane with adequate capacity is needed. No longer do most railroads pull pistons and liners one at a time. It has been found that it is a quicker operation to lift the roof of the locomotive to better enable lifting the pistons and liners out as complete assemblies in engine sets. It also helps in getting to the other parts of the locomotive. Cranes are an essential part of our diesel locomotive maintenance in every respect, from the small jib crane on the wall to the capacity needed in the large overhead type for the particular shop.

A small machine shop should be maintained as there is a certain amount of machine work that will have to be done even at a small maintenance point.

Another item that is often left in the background is the space allotted to the filling of fire extinguishers. This is too important an item not to be planned for, and when we are planning our shops, even the smallest one should have the proper facility to fill and test the fire extinguishers in the prescribed manner.

Lubricating oil, at a small point, can be handled in drums, but it is economically wise and definitely better to have large supply tanks as well as the tank for used oil. The oil from the new oil tank and the oil that is to go to the used oil tank should be available right at the pit to the locomotive for this saves a considerable amount of time in filling the engine with lube oil as well as removing the used oil from the locomotive. The pumping to and from of the lubricating oil from tanks to the locomotives makes a much cleaner shop as well as saving time and the assurance in your mind that the oil is not as likely to become contaminated. If it should be found that drums are the best answer to the lubricating oil supply problem at a maintenance shop, we should make up small trucks with pumps attached to the truck that can be easily maneuvered and handle enough oil on one truck to supply an engine.

Filter cleaning is a vital part of our diesel operation and the allowance for space as well as for the new filter cleaning equipment should be made when we are planning ahead for our shop facilities.

It can be assumed that the testing of lubricating oil is necessary for diesel operation. If it should be felt there is a need at a small maintenance point for lubricating oil testing, the proper space and instruments should be set up, for to successfully operate diesel locomotives we know that the knowledge of the condition of the lubricating oil is important.

Tools for the maintenance of diesel locomotives are an expensive item, but they are definitely needed if time is to be considered, and in many instances it takes one special tool to perform a certain job; therefore, much consideration should be given to a tool room and to having the proper tool when it is needed, as well as to keeping the tool in its proper place. Even at a small maintenance point tools could become costly if not properly maintained and accounted for.

Climatic conditions for the shop should be kept in mind for heating and cooling facilities are difficult and not nearly as efficient if we do not plan and build them into our shops when the facilities are being built.

A drop pit for dropping a single traction motor is needed at the smaller shop, and if circumstances warrant, a table large enough to drop an entire truck. This is an advantage to the maintenance point in that the placing of spare trucks enables a much quicker change.

In the category of the larger running repair shop the same facilities as were listed in the smaller shop, such as depressed pits, fueling, sanding, cleaning, fire extinguisher filling equipment, etc., are needed on a much larger scale. The size, of course, depends upon the number of locomotives to be maintained.

The sanding equipment as generally used in the larger shop is piped overhead from the sand drying furnaces to tanks where the dry sand is available. The cranes in the larger shop should be of sufficient capacity to lift a

## REPLIES TO QUESTIONNAIRE ON DIESEL SHOP AND TERMINAL FACILITIES

| | Group A | | Group B | | Group C | | Group D | | Group E | | Group F | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of railroads | 13 | | 12 | | 12 | | 11 | | 10 | | 8 | |
| Million manhours or more per year average | 50 | | 20 to 50 | | 8 to 20 | | 3 to 8 | | 1 to 3 | | 1 | |
| No. of Diesel Units Operated—Freight | 3666 | 282 | 1139 | 95 | 765 | 63 | 175 | 16 | 64 | 6.4 | 12 | 1.5 |
| Passenger | 1037 | 80 | 412 | 34 | 109 | 7 | 36 | 3 | ... | ... | ... | ... |
| Road Service | 891 | 68 | 955 | 79 | 184 | 15 | 152 | 14 | 116 | 11.6 | 35 | 4.3 |
| Switcher | 2822 | 217 | 1069 | 89 | 672 | 56 | 144 | 13 | 54 | 5.4 | 34 | 4.3 |
| No. of steam locomotives operated | 9940 | 764 | 1315 | 109 | 465 | 39 | 225 | 20 | 62 | 6.2 | 2 | ... |
| Total | 18356 | 1412 | 4890 | 407 | 2195 | 181 | 732 | 66 | 296 | 30 | 83 | 10 |
| No. of heavy repair shops on railroad | 25 | 2 | 20 | 2 | 14 | 1 | 13 | 1 | 9 | 1 | 8 | 0 |
| | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No |
| 1. Rewind traction motors and generators | 10 | 3 | 4 | 8 | 2 | 10 | 0 | 11 | 0 | 10 | 0 | 8 |
| 2. Repair injectors | 12 | 1 | 7 | 5 | 3 | 7 | 2 | 9 | 3 | 7 | 5 | 3 |
| 3. Reclaim liners | 10 | 3 | 8 | 4 | 7 | 5 | 9 | 2 | 2 | 8 | 3 | 5 |
| By replating | 4 | 6 | 5 | 3 | 2 | 5 | 3 | 6 | 2 | 0 | 3 | 0 |
| By reboring | 10 | 0 | 5 | 3 | 3 | 4 | 6 | 3 | 0 | 2 | 0 | 3 |
| 4. Are any diesel parts lubrized? | 5 | 8 | 4 | 8 | 3 | 9 | 1 | 10 | 1 | 9 | 1 | 7 |
| 5. Reclaim heads and liners to new style by welding | 6 | 7 | 3 | 9 | 5 | 7 | 0 | 11 | 2 | 8 | 0 | 8 |
| 6. Reclaim aluminum pistons | 8 | 5 | 7 | 5 | 9 | 3 | 4 | 7 | 4 | 6 | 1 | 7 |
| 7. Repair governors | 9 | 4 | 10 | 2 | 4 | 8 | 4 | 7 | 5 | 5 | 5 | 3 |
| 8. Repair four cycle injector pumps | 10 | 3 | 8 | 4 | 4 | 8 | 1 | 10 | 2 | 8 | 5 | 3 |
| 9. Repair radiators | 10 | 3 | 9 | 3 | 6 | 6 | 4 | 7 | 7 | 3 | 5 | 3 |
| 10. Repair damaged A-frames | 12 | 1 | 10 | 2 | 5 | 7 | 2 | 9 | 1 | 9 | 5 | 3 |
| 11. Grind own crankshafts | 1 | 12 | 11 | 1 | 1 | 11 | 0 | 11 | 1 | 9 | 0 | 8 |
| 12. Load test overhauled engines: | | | | | | | | | | | | |
| In locomotives | 12 | 1 | 12 | 0 | 11 | 1 | 8 | 3 | 7 | 3 | 5 | 3 |
| With portable plant | 7 | 6 | 8 | 4 | 6 | 6 | 3 | 8 | 2 | 8 | 0 | 8 |
| With stationary plant | 7 | 6 | 5 | 7 | 3 | 9 | 1 | 10 | 3 | 7 | 3 | 5 |
| 13. What facilities for detecting cracks: | | | | | | | | | | | | |
| Magnaflux | 13 | 0 | 12 | 0 | 10 | 2 | 10 | 1 | 6 | 4 | 3 | 5 |
| Magnaglo | 12 | 1 | 10 | 2 | 8 | 4 | 4 | 7 | 0 | 10 | 0 | 8 |
| Zyglow | 8 | 5 | 6 | 6 | 6 | 6 | 3 | 8 | 0 | 10 | 0 | 8 |
| 14. Is centrifuge filter cleaning machine used? | 11 | 2 | 9 | 3 | 8 | 4 | 5 | 6 | 2 | 8 | 3 | 5 |
| 15. Is lube oil piped to points of use? | 12 | 1 | 10 | 2 | 11 | 1 | 7 | 4 | 1 | 9 | 1 | 7 |
| 16. Is drain oil stored for reclaiming? | 13 | 0 | 12 | 0 | 9 | 3 | 7 | 4 | 2 | 8 | 0 | 8 |
| 17. Is lube oil reclaimed? | 12 | 1 | 12 | 0 | 8 | 4 | 3 | 8 | 1 | 9 | 0 | 8 |
| If yes, on the railroad property | 10 | 2 | 9 | 3 | 4 | 4 | 3 | 0 | 0 | 1 | | |
| to an outside concern | 6 | 6 | 5 | 7 | 4 | 4 | 0 | 3 | 1 | 0 | | |
| Is detergent replaced? | 7 | 5 | 10 | 2 | 6 | 2 | 3 | 0 | 0 | 1 | | |
| 18. Do you dry sand at each location? | 9 | 4 | 9 | 3 | 9 | 3 | 6 | 5 | 7 | 3 | 4 | 4 |
| If no, do you dry sand at central location? | 2 | 2 | 3 | 0 | 2 | 1 | 1 | 4 | 2 | 1 | 4 | 4 |
| Purchase pre-dried sand? | 5 | 8 | 0 | 12 | 2 | 10 | 3 | 8 | 1 | 9 | 0 | 8 |
| 19. Do you have depressed floor in main shops | 5 | 8 | 5 | 7 | 8 | 4 | 4 | 7 | 4 | 6 | 3 | 5 |
| In running repair shops? | 11 | 2 | 9 | 3 | 4 | 8 | 5 | 6 | 4 | 6 | 4 | 4 |
| 20. Are trucks removed by drop pits? | 10 | 3 | 8 | 4 | 6 | 6 | 5 | 6 | 2 | 8 | 2 | 6 |
| By transfer table? | 8 | 5 | 5 | 7 | 3 | 9 | 2 | 9 | 0 | 10 | 1 | 7 |
| By cranes? | 10 | 3 | 7 | 5 | 7 | 5 | 4 | 7 | 4 | 6 | 0 | 8 |
| By electric jacks | 9 | 4 | 7 | 5 | 3 | 9 | 3 | 8 | 3 | 7 | 5 | 3 |
| 21. Are automatic brush type washers used for cleaning road locomotives? | 8 | 5 | 6 | 6 | 3 | 9 | 0 | 11 | 0 | 10 | 0 | 8 |
| 22. Exhaust ventilating system in running repair shops? | 11 | 2 | 9 | 3 | 8 | 4 | 9 | 2 | 5 | 5 | 5 | 3 |
| 23. Are mobile refueling and sanding units used for large terminals and yards? | 6 | 7 | 1 | 11 | 2 | 10 | 0 | 11 | 0 | 10 | 0 | 8 |
| 24. How many days fuel supply are stored and is it considered adequate? | 30 | | 26 | | 35 | | 30 | | 45 | | 50 | |
| | 7 | 6 | 9 | 3 | 7 | 5 | 7 | 4 | 8 | 2 | 8 | 0 |
| 25. Are heavy repair shops—New | | 2 | 3 N&C | 1 | | 1 | | 4 | | 2 | | 2 |
| Converted | 11 | | 8 | | 11 | | 7 | | 8 | | 5 | |
| 26. Do you have portable, stationary, or both type platforms in running repair shops? Portable | | 1 | | 2 | | 4 | | 2 | | 3 | | 2 |
| Stationary | | 6 | | 6 | | 4 | | 5 | | 6 | | 4 |
| Both | | 6 | | 4 | | 4 | | 4 | | 1 | | 1 |

diesel engine, main generator, etc., for the trend is to have the large maintenance point change engines and main generators.

The drop tables are of utmost importance in the large repair shop. Many railroads are changing out complete trucks rather than individual motors, and this gives a much quicker change of traction motors.

There should also be much thought given to the checking of parts that are removed, either by the use of Magnaflux equipment or by the Dy-Chek method. These two methods tell the condition of the part to be put back in service. The large maintenance points take care of their own parts removed and applied by these methods.

Painting facilities are needed at the heavy maintenance points and should be prepared for by having the proper paint shop. This shop should have scaffolds that can be adjusted to the proper height to provide for accessibility. The locomotive paint shop deserves much consideration in shop planning for the future, as a paint shop is necessary to properly paint locomotives.

Material is an item of much consequence, and frequently overlooked until we get into a shop, but we should make out plans to have space allocated for the storage of such every-day items as needed in maintenance, and by the same token, place a person in charge of replenishing the supply of material right in the shop where it is to be used. This eliminates the practice of many people going to and from the storehouse, and at the same time gives ready access of material to the mechanics.

It would be well to have a place planned and designated for worked-up material to be placed at the disposal of the mechanics. By this we mean pistons ready for service, connecting rods, auxiliary generators, and other items available right in the shop where locomotives are maintained. Items as this certainly will reduce out-of-service time, and can be prepared for if these plans are put into effect when shops are built.

At this point we would like to bring out that some railroads have centralized points on their system where all parts are checked, cleaned, and repaired, and then shipped to the outlying maintenance points for use. We have in mind cylinder heads, pistons, connecting rods, lube and fuel oil pumps, engines, traction motors, and other such items. The facilities for these shall be discussed in our third item of shops necessary for the maintenance of diesel locomotives. This is brought out at this time to clarify the point that if this system is to be used, some of the machines and facilities for the larger maintenance shop should be changed.

The third shop of which we speak is the heavy repair or classified overhaul point where engines, traction motors, main generators, and other such items are rebuilt. Most railroads have set up a large shop to either handle the entire needs of the railroad, or placed more than one such shop on the system if the need for more than one heavy repair shop is necessary.

Before we go into different shops and facilities needed for heavy work, much thought will have been given to the extent of repairs and reclamation that is to be made by the particular railroad involved. Some railroads do not feel it wise to go into the heavy repair of parts, such as rewinding armatures, main generators, or the complete reworking of Diesel engines, such as line-boring, etc. Other railroads, and believed to be the majority as indicated by questionnaires, are performing their heavy repair work, as well as the reclamation of many parts. Either way the railroad should decide on the repairing of parts as this will make a difference in the shop facilities.

In the erecting shop for diesel locomotives it is well to again have sufficient cranes for the handling of the diesel engines and other parts. Some shops use the method of lifting the locomotive and rolling the trucks out, while other railroads use the drop pit for removing trucks, then place the locomotive on dollies for the movement around the shops.

The erecting shop is the center of much activity in that the removal and application of parts is the start and finish of the entire heavy overhaul work. From the erecting shop the engines are taken to other shops or bays; main generators to other shops or bays; traction motors, etc., are taken to their own particular place to be worked.

As stated above, the erecting shop is like the hub of the wheel in that the parts are going from and coming back to this shop.

In the shop for building of engines, Magnaflux or Dy-Chek equipment is needed for the engine parts. Many job cranes are necessary for the handling of the smaller parts. Smaller bays for shops are set off from the engine shop to repair the water pumps, lube oil pumps, governors, blowers, etc., prior to their being assembled in the diesel engine.

In the armature shop, with its necessary planning, machines, ovens, banding machines, spraying machines, high frequency soldering machines or soldering pots, are placed in locations where each movement of the armature will be in that one direction of final overhaul.

The traction motor assembly and field frame shops are frequently in the same building with the traction motor armature shop, which is well, because the work is so closely associated, but, if an older shop which has been changed from steam to diesel work is used, sometimes the two are separated, which depends upon conditions of the shops involved, and would greatly affect the repairs of traction motors.

If the building so warrants that all the electrical repair assemblies, such as main generators, traction motors, auxiliary generators, etc., are in one shop, this is an advantage. If not possible, facilities and shops for each individual item such as main generators and auxiliary generators can be separated rather than be mixed up with other parts to be repaired that are not related.

To this heavy repair shop most assemblies for other parts of the railroad are shipped for repairs; therefore, it is well to have the tools for the testing of each assembly as close as possible, so as to have assurance that the part is in working order when shipped to outlying points. This is a very important operation in a large overhaul shop and is worth while considering for space when planning the diesel shop.

Many railroads have gone into reclamation on a full scale, for money can be saved in the reclamation program. This program is to the extent that a shop properly equipped with tools, such as the latest welding equipment for aluminum welding and other type welding is necessary. Magnaflux equipment or Dy-Chek system is needed in this shop, and testing equipment is almost an absolute necessity to make sure that the job of reclaiming parts has been performed in a complete manner to insure a good used part.

## Results of Questionnaire to Railroads

The accompanying tabulation represents the average results of a questionnaire sent to 66 railroads. The results are grouped in the same arrangement as statistics furnished by safety section of A.A.R., namely, on a million man-hour basis. This was done to bring out opinions from various sized railroads as to how they are handling the problem of diesel facilities.

Fig. 1—Surfaces are built up in a sequence to limit temperature rise to 300 deg.

Fig. 2—Built-up housing ready for the machining done on the first set-up.

# Reconditioning Traction Motor Housings

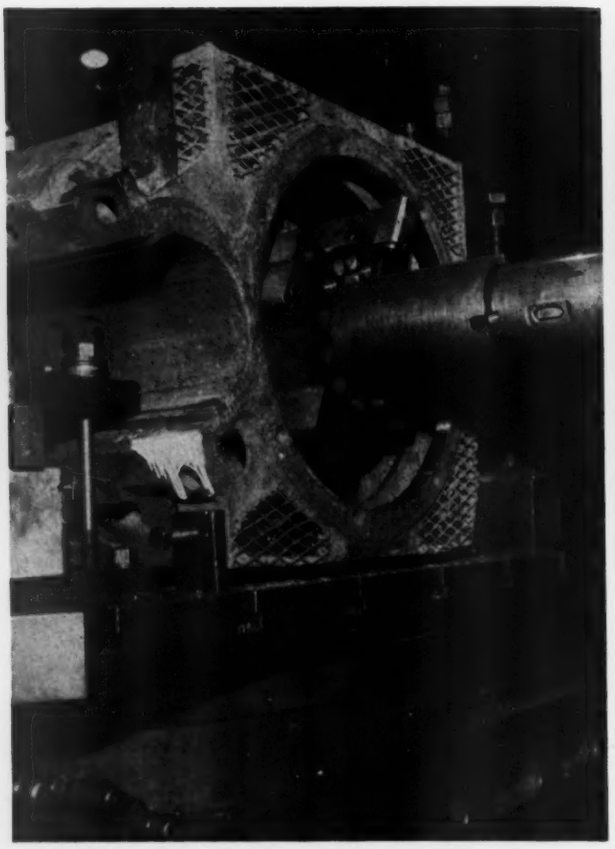


Fig. 3—Spider which holds either a boring or a facing tool.

Fig. 4—Pinion mandrel end of jig which automatically aligns surfaces bored in set-up No. 1.

TRACTION motor housings are reconditioned completely by the Louisville and Nashville at the South Louisville Shops. The first step in the procedure is to dismantle the housing to remove all electrical equipment, including both commutator and pinion end head, leaving only the

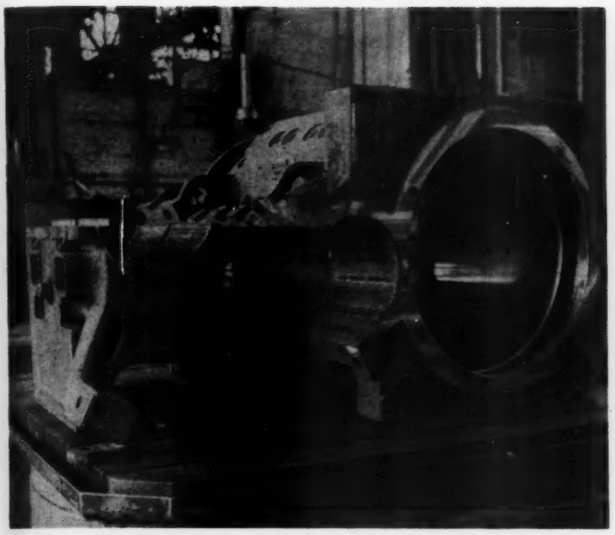


Fig. 5—Frame after completing operations in set-up 1 and ready for those in set-up No. 2.

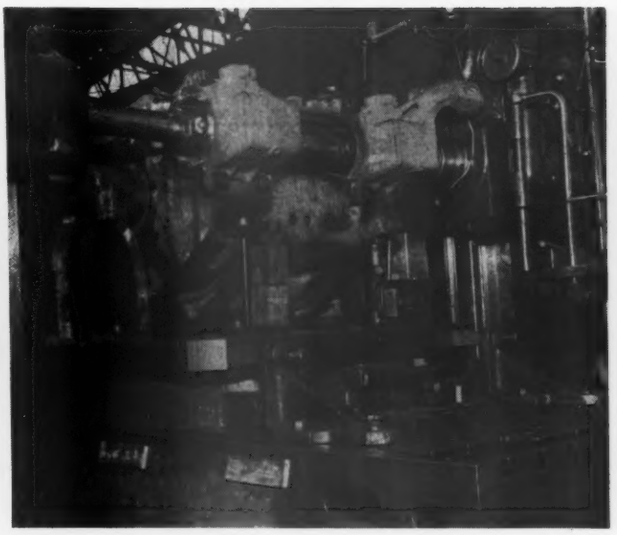


Fig. 6—The final reconditioning operation is boring the axle support bearings.

housing and the suspension bearing caps to be sent to the welding area. All wearing surfaces are built up, including all bores, the lateral bearing surfaces of the housing, and the suspension bearing cap.

The welding is done at one location using ⅛-in. E-6012 electrodes with straight polarity d.c. current. Comparatively small sections of each surface are done at a time, with each succeeding section staggered (Fig. 1) so that the temperature rise does not exceed 250 to 300 degrees. The welder skips from one surface to another after making one or two passes and checking the heat rise by feel to keep the temperature below that which may cause distortion.

After the application of each pass, the weld is peened thoroughly. The housings are given stress relief at 1,200 to 1,250 degrees for three hours. The cooling down to 500 degrees is done in a closed furnace with a minimum elapsed cooling time between 3½ to 4 hours. Normally the schedule is set up so that the housings are heat treated during the afternoon and allowed to cool down over night.

## Heat Treating Operations

When heat treating operations are completed the housing is moved to the machine shop where all surfaces are restored to standard dimensions in two setups on a Giddings and Lewis No. 560-T milling, drilling, and boring machine. A dial indicator is used to establish the center line.

For the first operations, the housing is positioned on a 5-ft. rotary table and the center line established (Fig. 2) by locating three of the four field coil pads true with the machine spindle. The pad nearest the axle bearing generally varies slightly from the true diameter as a result of welding in the axle bearing and thin wall section at that point; however, the maximum increase experienced, to restore the pads to true diameter due to this distortion, has not exceeded 1/32 in. on any of the 45 housings worked to date.

After the coil pads have been rebored, the commutator end of the housing is bored and faced to drawing dimension by use of the boring head shown in Fig. 3, the pinion end being machined in like manner by use of the same head.

The accuracy with which the second set-up is made determines the overall effectiveness of the rebuilding job. The housing is mounted in a jig (Fig. 4) designed properly to align the established center line, developed in the first operation, with the machine spindle. This jig is simple in construction and has three parts consisting of two identical mandrel supports and a 5¼-in. diameter mandrel. Both mandrel supports are line bored and have keys on their base to suit the tee slots in the rotary table; the mandrel is equipped with a fixed and a movable head tapered to center in the finish bores of the housing, the whole assembly being secured by a nut behind the movable head.

## Boring Axle Bearings

With the mandrel in place on the rotary table and the housing secured, the axle bearing is positioned to allow the seats to be milled to fit the axle bearing caps which have been machined on other equipment. With the bearing caps fitted, a .018-in. shim is inserted between the cap and the housing and the caps are then bolted in position.

The final and most important operation is the boring of the axle bearings (Fig. 6). The table is indexed 90 degrees and the boring bar put in position. An accurate check is made to establish the exact drawing dimension between the housing bore center and the axle bore to assure proper meshing of the motor and axle gears. An interesting method is used by the L. & N., although several methods are satisfactory. A predetermined diameter has been turned on the fixed head of the mandrel which fits the pinion end bore of the housing and the spindle diameter of the machine. The two dimensions are added together, divided by two and the result subtracted from the gear center dimension shown on the drawing. A round gage was machined to this decimal diameter and when properly used, gives accurate and dependable results. Line boring and facing of bearings and caps completes the repair.

After the motor has been reassembled, the .018-in shims are removed and .012-in. shims are used to provide the draw required when the bearing shells are installed.

# ELECTRICAL SECTION

# How Batteries Are Maintained at Grand Central Terminal

**Batteries are changed and trucks kept in continuous service. Size of installation justifies making on-the-spot repairs**

GRAND CENTRAL TERMINAL in New York City operates more than 100 battery-powered trucks to handle mail and baggage for the New York Central and the New Haven. Trucks operate 24 hours a day, seven days a week. During normal operations, 25 trucks are required to handle mail alone. On week ends, as many as 44 trucks are required just to handle newspapers. In peak periods—during Christmas, for example, and on heavy-travel holidays—each truck carries increased loads and works every minute of the shift.

To keep these trucks on the move at all times and prevent work stoppages, Grand Central Terminal follows carefully planned maintenance schedules.

Because of the large number of trucks, battery changing is staggered. No more than two trucks are at the battery room at a time. Each truck has its battery changed every other day, changes being scheduled over the three shifts.

An unusual lifting device, Fig. 1, has been fashioned to effect quick changes in baggage-carriers, the compartments of which so limit the size of batteries that they cannot be equipped with lifting lugs or handles. In some carriers, the batteries must be removed through the ends

Fig. 1—With the lifting device shown above, baggage-carrier batteries are changed-out in three minutes average time. The lifting yoke, engaged at the top by a hoist hook, lifts the batteries into their compartments with a minimum of manual handling

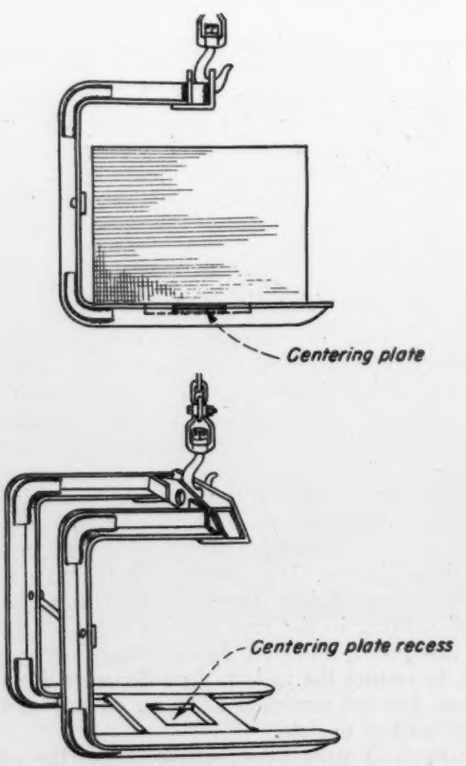



Fig. 2—Details of lifting hook construction showing how the battery rides on the hook. The centering plate recess is a hole in a strip of metal between the prongs of the hook. The centering plate, attached to the bottom of the battery, fits into the recess and keeps the battery in place on the hook

Fig. 3—An area in the battery room is reserved for such repairs as broken covers and broken posts. Carefully kept records help the Terminal to extend the life of its batteries and aids it in selecting replacement batteries

of the compartments because the compartment-tops do not open. Average time for changing batteries in any baggage-carrier is three minutes.

The pick-up element of the lifting device is a large lifting yoke, the top of which is engaged by the hook from an overhead hoist mounted on a monorail. When removing a battery from its compartment in a baggage carrier, the bottom of the yoke is slid into the compartment under the battery. A rectangular centering plate, approximately 5 in. by 8 in. by 1 in., fits into a recess in a plate on the yoke when the yoke is in the proper lifting position (see diagram). After positioning the yoke, the attendant lifts the battery slightly with the hoist, moves it horizontally out of the compartment, then carries it to the racks. Although the battery, riding the yoke parallel to the floor, appears to be in a precarious position, there is no danger of its being knocked from the yoke because the centering plate in its recess acts as a safety device to prevent the battery from shifting position and tipping the yoke.

When a battery is put on charge, records are taken as to which truck the battery was taken from, time placed on charge, voltage reading, specific gravity, and temperature. Similar data is recorded when the battery is taken off charge and put in another truck. There records enable maintenance men to tell whether a battery is being charged correctly, used properly in service, or nearing the end of its life. They enable corrective measures to be taken before battery damage or truck down-time due to battery failure occurs.

Batteries are given equalizing charges periodically to keep all cells in fully charged condition. Cells deviate in normal operation due to a number of factors which effect each cell differently—addition of water, temperature, differences of cell location within the tray, etc. When giving an equalizing charge, the battery is charged at the finishing rate, pilot-cell specific gravity readings being taken hourly until four successive equal readings are obtained. Then specific gravity readings are taken of all cells, and if any is abnormally low, an investigation is made to determine the cause.

In this connection, the battery room is equipped with a repair area (Fig. 2), so that repairs can be made on location. Such defects as damaged jars, broken covers, broken posts, etc., are repaired in this shop. The terminal maintains 225 batteries; it is this large number which justifies the on-the-spot repair shop.

Discharge tests are given the batteries periodically to determine battery condition. In making this test, fully charged batteries are discharged at the six-hour rate to a voltage of 1.75 volts per cell. Voltage readings are

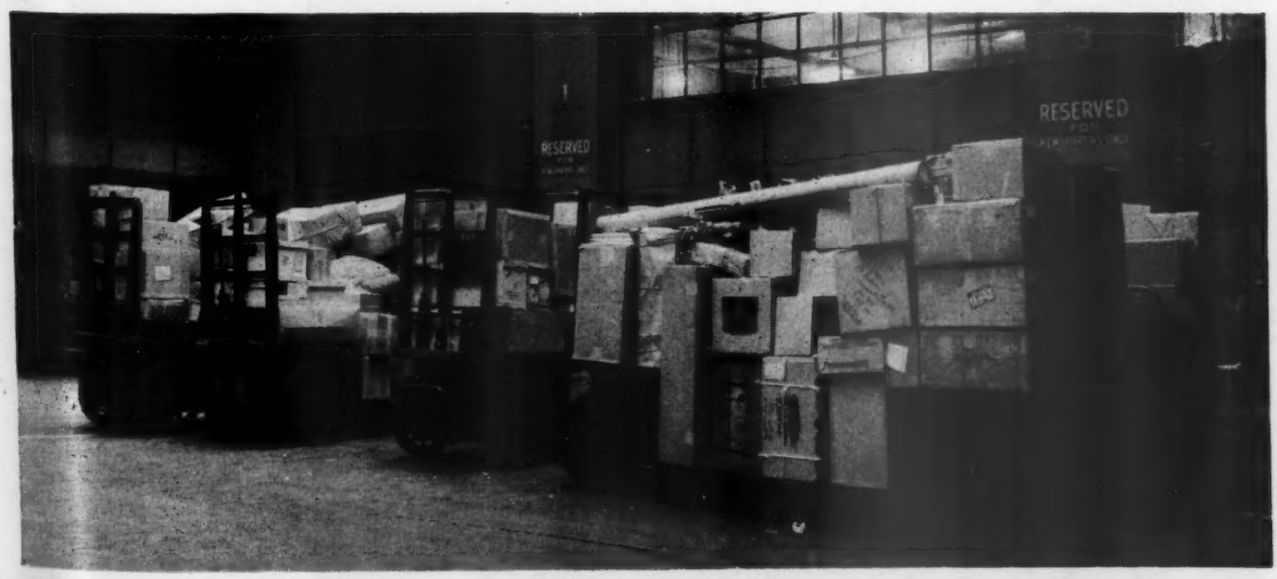



Fig. 4—Typical example of the severe demands on its 100 battery-powered trucks illustrates why well scheduled maintenance is particularly important at Grand Central. The terminal maintains 225 batteries in its baggage and mail operation

recorded throughout discharge and if 80 per cent or more of the rated capacity is obtained, the battery is returned to service. If, however, the battery is not within this range, the cause is determined and the battery is repaired or a replacement battery ordered.

In addition to everyday records, equalizing charge records, and discharge test records, master records are kept for each battery. These master records indicate the battery serial number, make, number of cells, ampere-hours capacity, and service location. A monthly record is kept on each battery indicating when the battery went into service, when major repairs were required, and when the battery was replaced. This record is useful when selecting replacement batteries.

All in all, this battery room is an exceptional example of good maintenance. The severe demands of the trucks (Fig. 4), particularly during peak periods, make this well scheduled system imperative. Not only does the system pay off in efficient truck operation, but it also results in long battery life. Proper battery care is doubly important today because the shortage of materials puts the metals from which they are made in the short supply category and demands the maximum kilowatt of every battery now in service.

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# D. & R. G. W. Relights Its Ticket Office

THE Denver & Rio Grande Western decided to relight its city ticket office at Denver, Colo., to create a more pleasing appearance. Smithcraft Mercury fixtures were selected for their high efficiency and attractive styling. The lighting intensity had been on the order of 15 to 18 foot-candles throughout the area open to the ticket buying public. Artists' perspective sketches were prepared of the various possible layouts, and the final arrangement of fixtures was selected from these drawings.

The fixtures installed have three 96T12 slimline lamps each, rated 72 watts per lamp, for a total of 3 watts per square foot. The resultant foot-candles after 100 hours of service were from 60 to 70, somewhat exceeding the calculated value and adequately fulfilling the requirement of presenting a very attractive ticket office to the eyes of the public.

A trial installation was made of low-voltage control of the lights, with a view toward evaluating the possibilities of this type control in future yard office construction. The equipment used was General Electric and consisted of three type RSS-1 switches, three type RR-2 relays and one RT-1 transformer. Switches were mounted on a column with low voltage SI 53083 remote control wire running to the 24-volt relays. Each relay controls one row of lights.

After five months of operation, the system has proved highly successful and indicates great reliability, in addition to ease of initial installation. Long switch-leg runs in conduit are entirely eliminated.

At the same time, the ticket office was relighted, three advertising display windows were likewise fitted with 96T12 slimline lamps. Ten lamps were installed in each window, giving 100 foot-candles on each display.

The lobby lighting in the building, indirect and concealed in a cove, was also replaced with the T12 slimline lamps, with special reflectors manufactured in the D. & R. G. W. Burnham sheet metal shops. These reflectors were rolled and formed to fit into the existing plaster cove. The slimline lamps give a soft diffused light throughout the entire lobby, and raised the illumination level to 12 to 14 foot-candles.

**The lighting units which are inconspicuous provide a bright and pleasantly-lighted interior**

# Flashovers—Causes and Remedies

**A candid statement of what is known about diesel locomotive motor and generator flashovers and some suggestions for keeping them under control**

SOME very frank talk on the general subject of locomotive generator and motor flashovers is included in a report presented by the Diesel Electrical Committee at the meeting of the Locomotive Maintenanc Officers Association, held in Chicago, September 15-17.

Concerning the available information on flashovers, the report offers the following:

Since about 1860, when the Englishman, Michael Faraday, discovered that electricity could be made man's servant, electric motors and dynamos have gradually and increasingly come into common use, and along with them the plague of flashovers.

Actually, less information has been accumulated on the subject of flashovers than the cause of aurora borealis and australis. Whereas, it is known that the magnetic needle is disturbed during the presence of a magnetic storm and that magnetic storms and sun spots occur simultaneously flashovers occur under any and all conditions. Theoretically, flashovers should not occur and no doubt, due to this fact, very little has been written on the subject.

Diesel locomotive propulsion generators and traction motors are, without a doubt, required to perform over a wider range of conditions than any other common electrical application, which no doubt contributes to the frequency of these undesired occurrences.

Only recently has extensive study on this subject been initiated. Tests are being made by causing flashovers on a direct current generator and readings of involved forces are being recorded. Technical information on these tests is not yet available but, will be soon.

Fundamentally, most flashovers originate as a leakage of current between brush holders of opposite polarities. This leakage may develop gradually as in the case of faulty commutation where fire stringers form and build up between brush holders, or it may occur suddenly as in the case of a heavy field distortion, which might result from either short circuit or sudden unloading. Porcelain insulators are shattered at times along with untold other electrical damage, and usually the power plant is rendered inoperative by the ground relay tripping.

Data on nineteen actual flashovers which occurred on diesel locomotives while in road service is enlightening from all standpoints except, unfortunately, the actual cause. The average tonnage of trains being drawn when flashovers occurred was 2,803; the least being 650, and the most being 4,750. The average speed was 32 m.p.h. with a low of 12 and a high of 55. Four cases happened on very heavy pull, one at high speed and the remainder average. Only one case occurred when wheels were spinning and likewise only one at time of transition. One reportedly happened when the throttle was being shut off for a railroad intersection, and none actually occurred while crossing rail intersections. One-third more flashovers occurred while locomotives were being operated in manual transition than in automatic. In all but three cases, brush tension and brush box clearance was correct. In eleven cases, generators were clean; four fairly clean and four were dirty. Most cases occurred while operating in the eighth position of the throttle and all transition positions were evenly involved. None happened on slippery rails. Different engineers were handling the throttle in every case, and one of the 19 cases happened on the same locomotive. In only one case, had the ground relay tripped prior to the flashover. All locomotives except one were of the same manufacture and two models were involved. After flashovers occurred, the resistance of insulation between high voltage circuit and locomotive ground was in three cases zero, in five cases between 150,000 ohms and one megohm and in eleven cases above one megohm. The maximum engine speed in all cases, except one, was normal or below normal, the one exception being but 10 r.p.m. high. In six cases, flashover damage was found in the traction motors also.

Suggestions for reducing occurrences of flashovers are summed up as follows:

From current available information, it would seem that in order to hold flashovers to a minimum, that the following precautions should be observed:

1. Keep commutators smooth, corners rounded and free of sharp points.
2. Keep spaces between commutator segments free of carbon and dirt.
3. Keep string bands and porcelains immaculately clean.
4. Keep brush tension consistent and as recommended by manufacturer.
5. Keep control apparatus in good repair and properly adjusted.
6. Keep enginemen informed as to proper method of handling throttle.

It is known from experience that the sudden unloading of a heavily loaded generator will create a flashover. It is also known that the abnormally high voltage which will result from delayed forward transition is conductive to flashover.

At preesnt, there are as many theories regarding flashovers as there are of the origin of the flying saucer, but it is hoped and believed that, with the present aggressive form of research work being carried on in this particular field, that we will soon be much wiser and more capable of preventing the serious electrical damage and resulting delays caused by these localized bolts of lightning.

Listed in the following are some of the detailed specific causes which the committee considers worthy of consideration:

### Machine Interior Susceptibility Factors

1. Flashovers may be caused by carbon, dust and oil vapors in the main generator. A high degree of cleanliness is required. There is a relation of megger readings to flashover susceptibility. Possible alterations may be made to give better control of contaminants such as filtering the generator air, redesign of the air compressor discharge piping system, and isolation of the generator from the engine room.

2. Traction motor string band cleanliness. Is cleanliness of motor more important than main generator?

3. Effects of various cleaning materials. It has been noted that main generators have flashed over more severely after cleaning than before, if a strong solvent wash is used.

4. Necessity of rounding ends of commutator bars, particularly after turning.

5. Importance of brushholder clearance to commutator and position of brushes with respect to neutral.

6. Condition of brushholder porcelains.

7. Condition of string bands.

8. Commutator surface condition.

9. Brush conditions.

10. Main generator and traction motor design features to minimize field distortion with sudden armature current change.

**Voltage or Current Surge Producers (External to Machine)**

Surges resulting in flashovers may result from any of the following sources:

1. Throttle handling.

2. Reversing.

3. Operation in manual transition at speeds above or below proper changeover speed.

4. Prolonged operation at speeds close to or exceeding designed maximum locomotive speed.

5. Improper timing of relays and contactors during transition sequence.

6. Improper automatic transition settings. There is need of spread between pick up and drop out settings.

7. High rate of generator field decay rate during transition. Effect of defective field discharge resistor and relation of resistor value to field decay rate.

8. Automatic transition design features.

9. Insufficiently sensitive ground relay. Will a faster acting ground relay reduce the extent of flashover damage?

10. Is it known that most flashovers occur during wheel slip? How much wheel slip?

11. Unloading and loading the generator. What is the proper way to unload and reload the equipment when wheels slip so as to minimize chance of wheels slipping again? Of what importance is load regulator timing.

12. Diesel engine overspeed and load control settings being set for too high.

13. Interlock and contact difficulties which might cause main or field circuit to make and break while under full load. Particular points of trouble such as battery field contactor interlocks, wheel slip relay contacts, ground relay contacts, motor shunting contactor interlocks and control jumper receptacles.

14. Proximity of main contactor breaking arcs to cabinet doors or other structural members. Effectiveness of arc blowout features.

The report was prepared by a committee of 16, and presented by Committee Chairman W. P. Miller, assistant to chief mechanical officer, Chicago & North Western.

# Metalized Motor Shafts Last Longer

The Atchison, Topeka & Santa Fe has since 1950 been using metal spray for restoring the bearing fits of traction motor shafts and also for building up the bore of bearing housings.

In 1949, 18 per cent of the motors coming into the railroad's shop at San Bernardino, Cal., for periodic overhaul required new shafts because of wear at the inner race fit. In 1950, metallizing of bearing fits was started and in that year, only 11 per cent of the overhauled motors required new shafts. During 1951, the number of motors needing new or reclaimed shafts was reduced to 6 per cent.

The surface of the shaft or the bearing housing fit to be metallized is prepared by grinding, great care being taken to keep the ground surfaces free of oil or even finger marks before the metal is applied. The thickness of the added metal does not exceed .006 in. or enough to increase the shaft diameter a maximum of .012 in.

Metallizing an outer bearing fit in a traction motor bearing housing

A diesel traction motor with brush cover removed and with the grinder and vacuum nozzle in place

The vacuum cleaner effectively removed all copper dust during the grinding operation

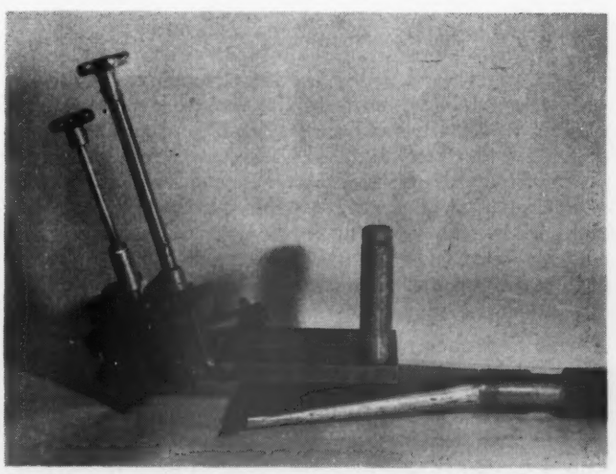
# Dust-Free Commutator Grinding

Complete removal of grinding dust while grinding commutators in place is accomplished by a method developed in the Sacramento, Calif., shops of the Southern Pacific. The commutators are ground with an E.M.D. fixed-stone grinder and shop-made adapters provide for using the grinder on General Electric and Westinghouse, as well as Electro-Motive, motors and generators of all types. The grinding dust is carried away during the grinding operation by a vacuum produced by a 5-hp. Hoffco-Vac No. 50 portable cleaning unit.

For the grinding operation, the brush holders are removed from one brush stud and the grinder secured to the stud. One of the four-point handles is used to bring the stone up against the commutator and the other is used to move it back and forth across the commutator while the motor armature is driven at low speed from a low-voltage d.c. power source.

A specially shaped nozzle is placed close to, but not touching the commutator just below the grinder in the direction of travel of the armature. The nozzle is secured in this position during the grinding operation. Air is drawn into the nozzle by the vacuum cleaner. The original nozzle, shown in two of the illustrations, is made of metal and is fitted with a rubber lip to keep it from scratching the commutator. Now that the most effective nozzle contours have been established, additional nozzles will be made of plastic.

Before this method of removing grinding dust was used, various means of blowing the dust out were tried. During the course of these experiments, it was found that even four jets of air from the pinion end were ineffective in removing the copper dust. Since the vacuum nozzle has been employed, no difficulty caused by copper dust has been experienced.



The grinder and nozzle removed from the motor and placed to show their relative position during the grinding operation

# DIESEL-ELECTRIC—How to Keep 'Em Rolling

## 13 Power Switches, Reversers, Control Switches, Controllers, Breakers and Fuses

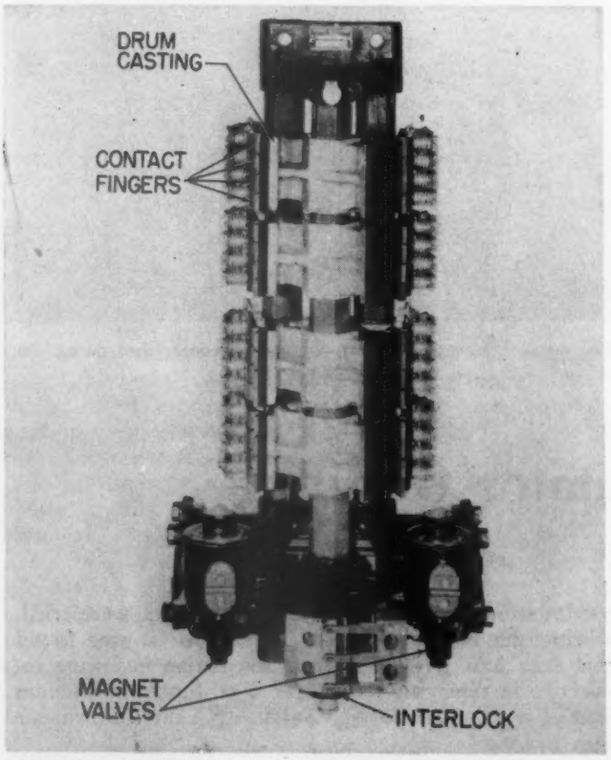



Fig. 1—A drum-type reverser used on diesel-electric locomotives

SWITCH is a word with all sorts of meanings. To many it recalls childhood visits to the woodshed. To a railroader it means a number of things. Perhaps the commonest is the track switch. Everyone knows how these are used to guide trains onto the right tracks. In the same way electric switches are used to put current into the right wires. They are made in many sizes, shapes and forms. We are now going to take a look at some electric switches found on locomotives.

### Power Switches and Reversers

We already know that a contactor is used to open and close electric power circuits. Power switches are also used in these circuits. Such switches are the "pin boys" for the contractors. They set up the circuits before the contactors close, and rearrange them after the contactors open. But they are not used to open or close circuits in which current is flowing.

The reverser is one power switch found on all diesel-electric locomotives. When the engineer wishes to back up, he moves the reverse handle on his controller to the reverse position. This causes the reverser to throw to the reverse position and change the connections of the traction motor fields. Since the flow of current in the fields is reversed, the motors will turn in the opposite direction and the locomotive will back up. The reason for this was explained in the first article of this series.* To avoid damage, the reverser should be thrown only with the throttle off and the locomotive standing still.

Two types of power switches are found on locomotives. While they are quite different mechanically, both are used as reversers. This might seem confusing at first. However, you can easily learn to tell them apart. Because they are different, they need different care. If you learn to tell them apart and how to maintain each, you will not have any trouble.

### The Drum Switch

The reverser shown in Fig. 1 is what is commonly called the drum-type switch. In the picture you see the four drum castings and eight banks of contact fingers. Each bank contains four fingers. These fingers ride on the drum castings. Now let's see how this reverser does its job.

Fig. 2a shows a traction motor armature, its field, and a reverser as they appear on a wiring diagram. To change the direction in which the motor turns, we only need to change the direction of current flow in its field. This is the reverser's job; but the wiring diagram does not show how it's done. The sketches in Fig. 2 help explain it.

Suppose you wrap a strip of paper around the two top drum castings and mark the finished metal surfaces where the fingers ride. When you remove the paper and spread it out flat you will have a pattern like that shown in Fig. 2b. Here lines have been added to show how the segments are connected together. Actually these connections are part of the drum casting. Now, if you add the rest of the electric circuit to this sketch you will have Fig. 2c. The four small shaded squares for each connection are the fingers that ride on the drum surface. The motor armature and fields are connected to these banks of fingers. Arrows show the path that the current will follow when the motor is connected to the generator.

This is the thirteenth of a series of articles on the maintenance of diesel-electric equipment. This article is written by B. L. Judy and P. W. Pelton, both of the Locomotive and Car Equipment Department, General Electric Company, Erie, Pa.

* Railway Mechanical and Electrical Engineer, July 1951, Page 72.

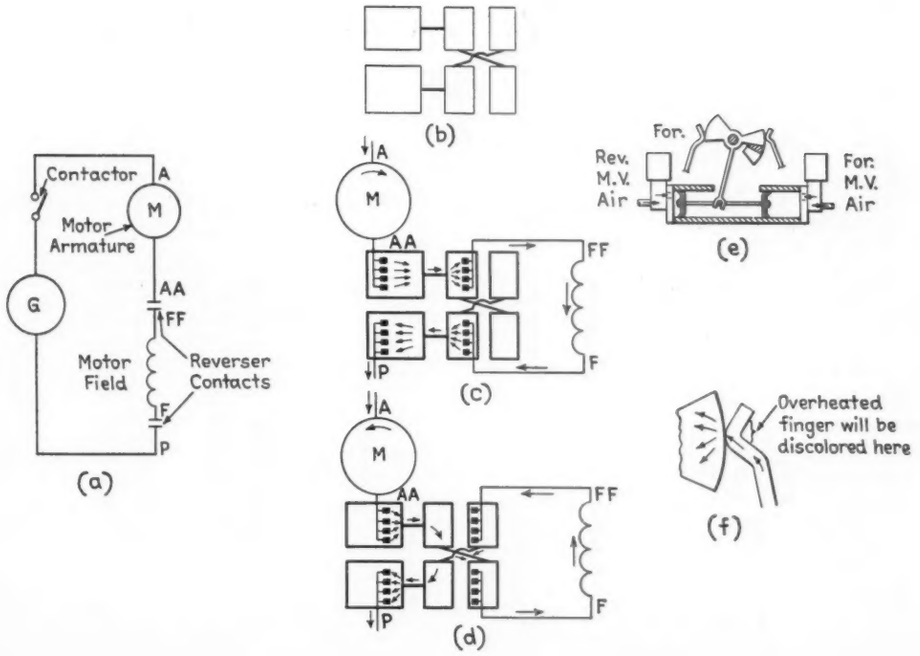



Fig. 2—How a drum-type reverser operates

Note that the current flows from *FF* to *F* through the motor field. Now look at Fig. 2d. This shows the reverser thrown to the other direction. As you follow the arrows you will see that the current through the motor field has reversed and now flows from *F* to *FF*. So the motor will turn in the opposite direction and the locomotive will back up.

The reverser is thrown by an air piston and magnet valve like that used on an air-operated contactor. To get both motions two pistons and two magnet valves are used, as shown in Fig. 2e. When the engineer moves the reverse handle on his controller to the forward position, current flows through the "forward" magnet valve coil. This opens the valve and admits air to the right hand cylinder. The pressure forces the piston and reverser drum to the position shown. When the engineer moves the reverse handle to the reverse position, current flows through the "reverse" magnet valve coil. This admits air to the left hand cylinder. The air piston is forced to the right, moving the drum to the reverse position.

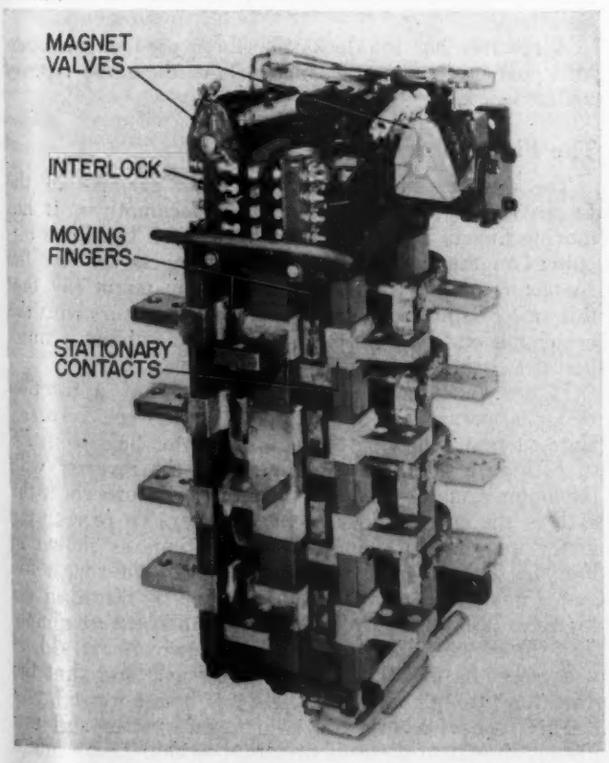



Fig. 3—A finger-type reverser used on diesel-electric locomotives

The magnet valves and piston packings require the same sort of maintenance as already described for air-operated contactors. If the packings are not kept lubricated you will have a sluggish reverser. This can cause the locomotive to act up like a clown.

Reverser air lines are important too. A leaky line can cause sluggish reverser operation. If a line breaks it will make the locomotive dead in one direction. Leaks should be fixed as soon as they are found. A small leak today may be a broken air line tomorrow.

The fingers on a reverser are just as important as the fingers on your hand. In Fig. 2f you see an enlarged view of a finger resting on a segment of the drum casting. Arrows show the path of the current from the finger into the segment. On this particular reverser there are four fingers for each incoming connection. Each should carry its share of the current. Otherwise there will be trouble. Here are a few points to watch.

When the reverser throws there is sliding contact between the fingers and segments. To cut down friction and wear you should keep a film of lubricant on the segments. This lubricant can give you trouble in two ways. First, it may get dry and gummy. This usually happens if the segments are not lubricated often enough, or if the locomotive is operating in a very hot climate. Second, the lubricant may get dirty. Either gummy or dirty lubricant may build up under some of the fingers so that they do not carry current. This means that the rest of the fingers will have to carry all of the current. These overloaded fingers will get hot. You can spot them by a bluish-purple color on the back of the finger where it touches the seg-

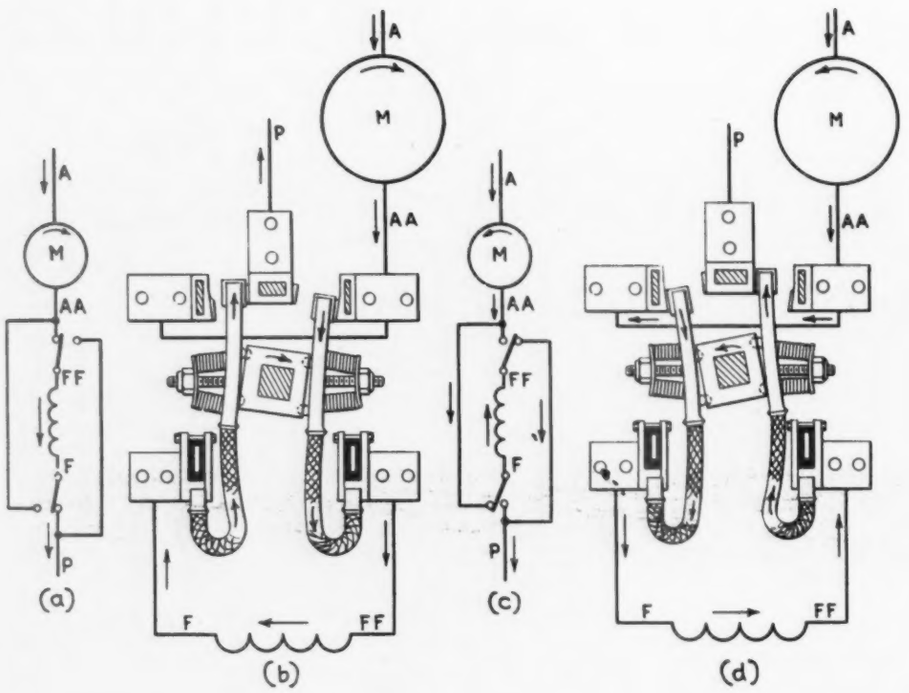



Fig. 4—How a finger-type reverser operates

ment (Fig. 2f). If the dirty fingers are not cleaned up and put back to work, you will end up with a welded reverser. This means a dead locomotive unit when traveling in one direction. It also means a repair job for the shop. A good way to avoid such trouble is to periodically wipe the drum with a cloth soaked in cleaning solvent. Then apply clean, fresh lubricant. The climate in which your locomotives operate and the lubricant you use will largely determine how often this should be done.

Contact pressure is another point to watch. If it gets low because of poor adjustment or wear, the fingers will overheat. In general, the fingers can be used until they are worn half-way through before replacement. If the pressure is too high, the fingers will wear rapidly and will cut grooves in the segments. When the finger path is worn more than 1/16-in. deep, the drum should be taken out and turned on a lathe.

Since a reverser must be lubricated, some oil will likely get onto the insulated surfaces. Here it will collect dirt. In time a conducting film will be formed over the insulation. Then a ground or creepage failure will follow. So, from time to time, wipe these surfaces with a cloth soaked in an oil solvent.

Sometimes a reverser throws while carrying current. This is usually reported as a flashed reverser. You can recognize it by the burned edges of the segments and fingers. When you find a flashed reverser, you had better clean it up. If you don't you may have a burned up reverser the next time you look at it. Badly damaged fingers should be replaced. When you replace a finger, adjust the contact pressure according to your instruction book. If the damage is slight the finger can be cleaned up on a grinding wheel or with a fine file. A file can also be used to clean up the segments unless they have been badly damaged. In that case they will have to be turned on a lathe.

A reverser has interlocks like those used on air-operated contactors. They will need about the same type of maintenance.

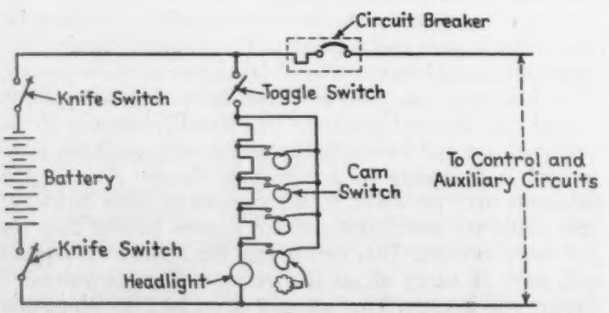



Fig. 5—How control switches are used in Locomotive auxiliary circuits

## The Finger-Type Switch

The reverser shown in Fig. 3 is an example of the finger-type of power switch used on locomotives. It has moving fingers instead of a drum to switch from one circuit to another. In many ways these fingers are like the contactors we have already studied. You might say that this switch is made up of air-operated contactors with the arc chutes and blowout coils left off. It combines a number of switches into one unit to save space.

Figure 4a shows the wiring diagram of a traction motor armature and field, and a finger-type reverser. Here current is flowing through the motor field from *FF* to *F*. Figure 4b shows two fingers of the reverser with the motor armature and field connected. Arrows show the path of the current through the reverser. To reverse the motor we want to change the connections as shown in Fig. 4c. Then the current will be flowing through the motor field from *F* to *FF*. This is done by throwing the reverser. Instead of turning a drum in this case we simply turn the contact finger support, as shown in Fig. 4d. If you trace the current path now you will find that the direction through the motor field has been reversed.

This type of switch has two magnet valves and two pistons similar to those on the drum switch. They require about the same type of maintenance.

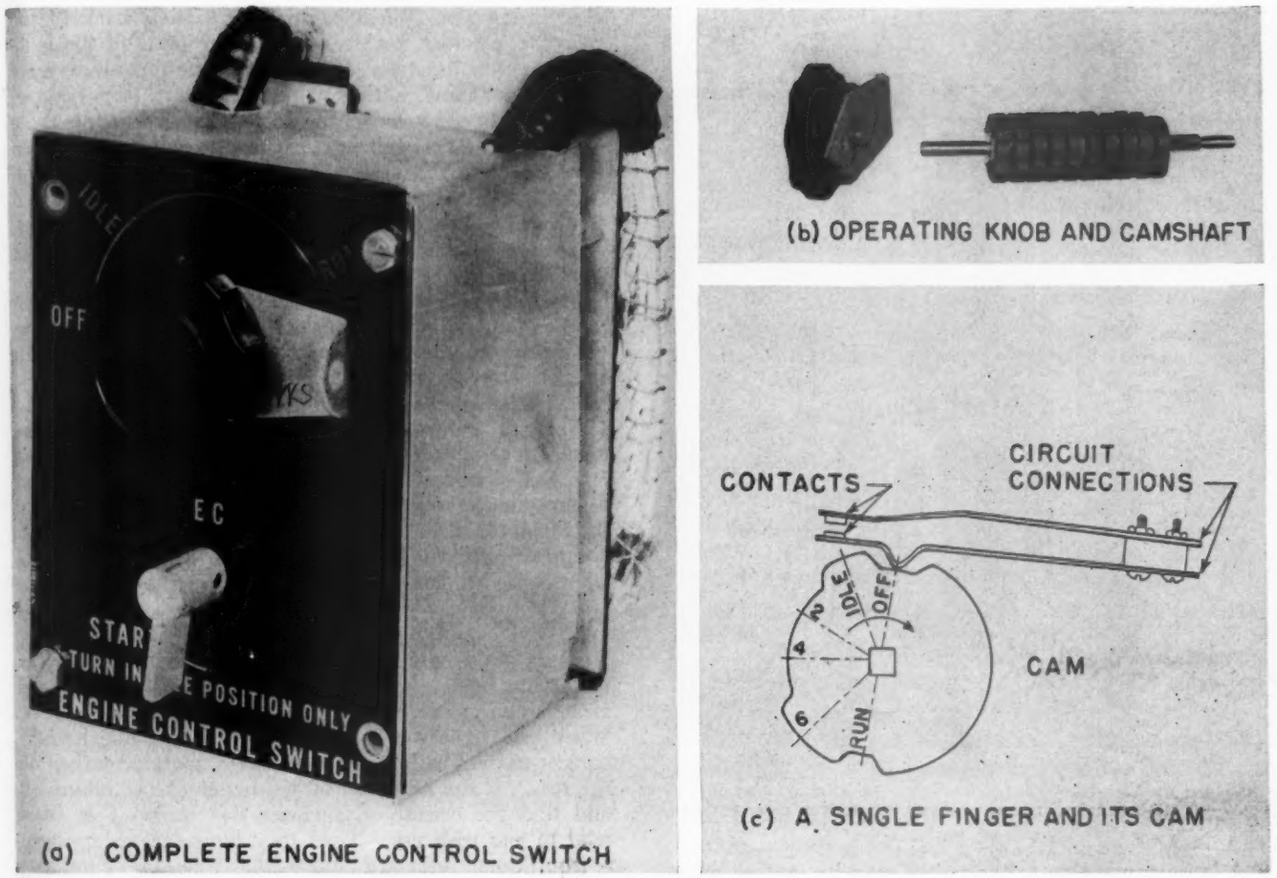



Fig. 6—A cam-operated switch, showing some of its parts and how it works

Since the reverser contacts do not break current, they will require little if any maintenance. They should last much longer than contactor contact tips. Replacement is seldom necessary between overhauls. The contact surfaces should be treated like those on air-operated contactors. By all means do not treat them like the drum-type switch. Since these fingers do not slide on a drum they do not require lubrication. If they are lubricated, the oil will collect dirt and will cause the fingers to insulate and burn. If somebody has made a mistake and lubricated these fingers, they should be wiped off with a cloth soaked in oil solvent.

The contact surfaces on this reverser are silver. Because of this, a file should never be used unless it is absolutely necessary. Contacts can be used until the silver is nearly worn through, provided contact pressure is maintained. Lubricate pivot points, bearings and gears, if used, according to your instruction book. If a stationary contact overheats, be sure to take a careful look at the insulation on its support bar. If the insulation has been damaged by heat it is best to replace the bar.

## Another Job for Power Switches

Some locomotives have what is called dynamic braking. On these locomotives the engineer can use the traction motors to brake his train on down grades, and also to help bring it to a stop. Of course, the motor circuits must be rearranged for dynamic braking. A power switch similar to the reverser is used to do the job. It is called the braking switch. In changing from motoring to braking, the power is first cut off from the traction motors. Then the braking switch throws to set up the braking circuit. In going from braking to motoring, the braking current is first cut off. Then the switch throws to set up the motoring circuit. So you see the braking switch, like the reverser, does not throw while it is carrying current. It should be maintained in the same way as described for reversers.

## Control Switches

There is another line of switches used on diesel-electric locomotives. These switches are in the low voltage battery control circuits and are called control switches. They differ from power switches in that they may interrupt circuits that are carrying current. This current is usually small, however, and forms only a very small arc. Fig. 5 shows a typical circuit including the principal types of control switches. Let's take a look at them.

Toggle Switch. A common example is the wall switch you use to turn the lights on and off at home. Because of its snap action it is well suited to open or close low-current circuits. Most of these switches used on locomotives are sealed and need no maintenance. Wires are usually connected to them by means of screws. It is a good idea to keep these screws tight.

Circuit Breaker. This is little more than a toggle switch with a trip mechanism added. It is designed to carry a certain current, which is usually marked on the switch. The trip is a bimetallic strip which heats up when it carries current. Currents in excess of the rating, heat the strip enough to trip the breaker. The greater the overload the quicker the breaker will trip. There is very little maintenance on a circuit breaker. If you are having trouble, here are some things to look for—

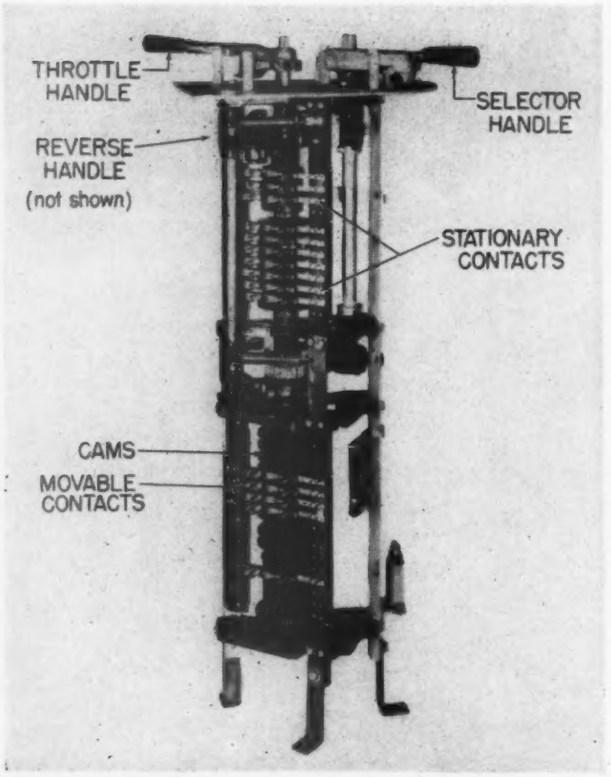



Fig. 7—A master controller used on diesel locomotives, cover removed

A loose connection to the switch may be causing overheating. This may not damage the breaker, but it will cause a false operation of the trip.

If the breaker is located near some equipment that gives off a good bit of heat, it may trip falsely.

At times you may find a breaker that is sensitive to shock. This means that if you bang the panel where it is located it may trip.

Look for these things before you change out the breaker or check the circuit connected to it.

CAM-OPERATED SWITCHES. One type of a cam-operated switch is shown in Fig. 6. Often a number of these switches are combined to form one unit. If the cams are arranged on a single shaft, you can get a number of circuit combinations simply by turning the knob. Good examples of this are the motor cutout switch and the engine control switch. Dirt and oil are the worst enemies of these switches. They build up an insulating film between the contact surfaces and the switch can't complete the circuit. When covers are used they help to keep the dirt out. If oily dirt accumulates on the fingers, it should be removed with a small paint brush and an oil solvent. Don't use sandpaper or emery cloth on the tips. If you have to dress them down, use a fine ignition file.

KNIFE SWITCH. This is one of the simplest means of opening and closing an electric circuit. The battery switch on locomotives is, in most cases, a knife switch. It is used to disconnect the battery from its circuits when the locomotive is shopped. Normally a knife switch needs little or no care. If it has been opened when carrying a large current, arc damage may have resulted. Then it will be difficult or impossible to close the switch. Use a file to smooth the damaged parts. When closing a knife switch be sure to push the blade all the way in.

The controller does one of the most important jobs on the locomotive. It changes the engineer's wishes into electric signals. Wires carry these signals back to the relays, contactors, reversers and other parts of the locomotive control system. By operating the throttle, reverse and selector handles, the engineer can start, stop, reverse, speed up or slow down the locomotive. Moving these handles operates switches inside the controller which open or close the various control circuits. Many controllers, like the one shown in Fig. 7, use cam-operated switches. There are also some drum-type controllers. These are similar to drum-type reversers except they are smaller.

Most controllers have mechanical interlocking between the handles. This is to prevent the engineer from moving the wrong handle and damaging the electric equipment. For instance, the reverse handle cannot be moved unless the throttle handle is in the "off" position.

Normally controllers require little maintenance. Loose connections and dirt on the contact surfaces are the most common causes of trouble. At times you may also find fingers that have been damaged by arcing. These should be replaced. Other difficulties will usually be reported by the engineer. You will have little trouble in finding what caused them.

### Fuses

Fuses are used on locomotives in much the same way as in your home. They prevent damage of the wires and electric equipment in a circuit when an overload occurs. When you replace a fuse, be sure the new one has the correct current rating. This is usually plainly marked on the fuse. If the new fuse blows, better check the circuit and find the cause. Experience has shown that fuses tend to age with use. Then they blow for no apparent reason. Some fuses are built so that when they blow you replace the metal ribbon only. When putting in the new ribbon be careful not to bend it. If you do you will reduce its rating and cause it to blow much sooner than it should.

### Little Things, but . . .

We all know the old proverb, "Great oaks from little acorns grow." It's as true with locomotives as with trees. If you plant the little acorns of good maintenance practices, you will grow the great oaks of reliable operation and high motive power availability.

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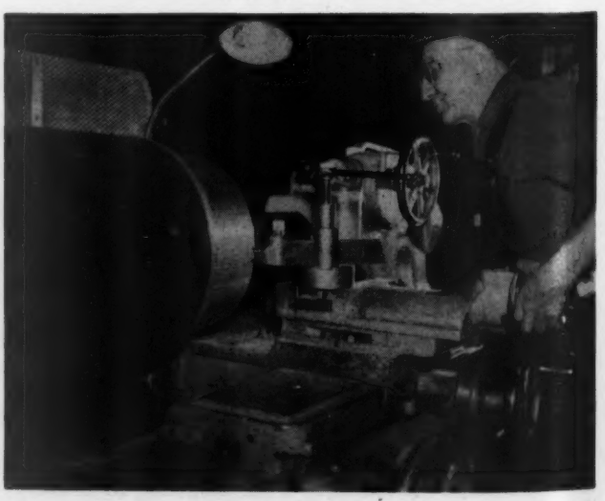

Twenty-five-inch lathe used exclusively by the Great Northern for generator and motor overhaul

# QUESTIONS AND ANSWERS

## Diesel-Electric Locomotives*

### Engine Temperature Thermostat—Operation

***605-Q.—How does the setting dial (16) function?***

A.—Rotating the setting dial changes the total length of the element stem (17).

***606-Q.—What changes are brought about by the alteration in element stem length?***

A.—The position of the auxiliary lever at a given element temperature is changed, and thus the force exerted on the main lever by the main spring, at that temperature.

***607-Q.—What must ensue to enable the thermostat to regain control?***

A.—A temperature change at the thermal element is necessary to change the main spring force back to the value needed to maintain the desired branch line pressure.

***608-Q.—How does the thermostat function as compared with the temperature gauge?***

A.—The thermostat controls water temperature into the engine while the temperature gauge indicates water temperature out of the engine.

***609-Q.—What is the difference in temperature?***

A.—About ten deg.

***610-Q.—At what range is the thermostat set?***

A.—The thermostat is set with a throttling range of 10 deg.

***611-Q.—What does this mean?***

A.—A temperature variation of plus or minus 5 deg. about a control point of 150 deg. F.

***612-Q.—How will the shutters therefore operate?***

A.—From a closed position with the fan stopped (145 deg. and 17 psi.) branch line pressure to an open position with the fan running at maximum speed (155 deg. and 0 psi.) branch line pressure.

***613-Q.—How is the control point setting changed?***

A.—Remove the cover by unhooking the spring latch, then turn the setting dial (16) in the proper direction as indicated by the marking on the dial.

***614-Q.—How is the calibration checked?***

A.—Immerse the element in a 150 deg. F. bath and let the system balance out. If the branch line pressure is not sufficiently close to 8 psi., loosen the two dial plate locking screws and turn the knurled setting knob until the branch line pressure registers 8 psi. Tighten the two locking screws.

***615-Q.—How is the cover replaced?***

A.—To replace the cover, wrap it around the head of the instrument and snap the spring catch back in place.

***616-Q.—What may impair the operation of the thermostat?***

A.—Dirt or dust collecting on the lever system.

***617-Q.—How may this be prevented?***

A.—This can be prevented by blowing out such an accumulation with a low pressure air stream.

### Pneumatic-Electric Relay

***618-Q.—What is the Pneumatic Electric Relay?***

A.—The Pneumatic Electric Relay is a pressure control with a non-adjustable differential.

***619-Q.—What is the operation?***

A.—Air pressure, at a predetermined setting, operates a single pole double throw snap switch through a low pressure bellows.

***620-Q.—What is the operational design of this relay?***

A.—The relay is designed to convert the gradual air pressure changes into positive electrical switching action.

***621-Q.—Reference to Fig. 8, how is the cut-in pressure set?***

A.—Set the pressure indicator (6) at the cut-in pressure desired by means of the pressure adjustment screw (2).

***622-Q.—What happens on a rise in pressure?***

A.—On a rise in pressure the switch will break contact red to blue at the main scale setting plus the differential Fig. (9).

***623-Q.—What happens on a drop in pressure?***

A.—The switch will make contact red to blue at the main scale setting.

***624-Q.—For example, if the pressure setting indicator is set at 11 pounds and line pressure is 0 psi., how is the switch?***

A.—The switch will be making red to blue.

***625-Q.—What happens when the line pressure reaches 11 lb?***

A.—When the line pressure reaches 11 pounds plus the differential or approximately 12.5 pounds, the switch will break red to blue.

***626-Q.—When the line pressure is above 11 lb. and then decreases, what is the result?***

A.—The switch will make red to blue at the main scale setting of 11 lb.

***627-Q.—What should be done after the controller has been installed?***

A.—After the controller has been installed, wired and set, it should be tested by raising and lowering the pressure to make sure that it operates the radiator fan properly.

***628-Q.—What may be done if the cut-in and cut-out points do not agree with the pressure gage?***

A.—In this case the scale plate on the controller may be moved slightly up or down until the gage and plate agree.

***629-Q.—What precautions should be observed when checking the operation?***

A.—It should be borne in mind that this controller has been carefully checked at the factory with an accurate gage, therefore maintenance personnel should be sure to use accurate pressure gages when checking the operation.

### Shutter-Grad-U-Motor

***630-Q.—What is the Grad-U-Motor?***

* This series of questions and answers relate specifically to the Alco-G.E. Diesel electric locomotives. The figure numbers and references, by number, to diagrams, etc., relate to the current edition of the Alco-G.E. operating and maintenance manual.

A.—The Grad-U-Motor is a piston motor.

***631-Q.—Of what type is this piston motor?***

A.—This motor is of the positive positioning non-bleed variable position type.

***632-Q.—What functions to perform the piloting action?***

A.—The piloting is performed by low pressure air (0-15 psi.).

***633-Q.—What brings about the positioning of the shutters?***

A.—The positioning of the shutters is accomplished through the use of main reservoir pressure.

***634-Q.—What establishes the motor position?***

A.—The air pressure in the Grad-U-Motor.

# Schedule 24 RL

# Air Brakes

### Operation of F-Type Relay Valves

***1400-Q.—Does this additional pressure affect the main diaphragm 38?***

A.—Yes, this additional pressure is transmitted through the diaphragm stack to the main diaphragm *38*.

***1401-Q.—In this case what ratio would be developed on the main diaphragm?***

A.—Diaphragm *64* has an area of only 60 per cent of main diaphragm *38*, therefore the effective pressure on the main diaphragm is limited to this ratio.

***1402-Q.—In response, what will the self lapping portion develop?***

A.—The self lapping portion will develop approximately this ratio of brake cylinder pressure or, in other words, the brake cylinder pressure realized from any given reduction of brake pipe pressure will be approximately 60 per cent of the control pipe *16* pressure.

***1403-Q.—What takes place at the F-6 relay valve as the brake cylinder pressure builds up?***

A.—Brake cylinder pressure builds up in the central cavity *F* and acts on the right side of the main diaphragm in opposition to control pipe *16* pressure on the left.

***1404-Q.—What takes place when the pressures on the main diaphragm become equal in force to that on the 60 per cent diaphragm?***

A.—When the pressures thus become equal, spring *42* returns the piston *36*, relieving the pressure on lever *43*.

***1405-Q.—What then takes place?***

A.—Springs *33* and *34* then seat the application piston valve *30* and its pilot valve *32*, and through stem *29* pivots the lever *43* at its upper end, holding the exhaust piston *25* and its valve *23* closed retaining brake cylinder pressure.

***1406-Q.—In what position is the relay valve at this time?***

A.—This is Lap position in which the relay portion maintains brake cylinder pressure against leakage.

***1407-Q.—What action takes place in the event that brake cylinder pressure in chamber F is reduced?***

A.—This will permit the greater force on the left of the diaphragm *38* to again open the application valve, permitting main reservoir air to flow to the brake cylinders until the balance is restored on the main diaphragm.

***1408-Q.—Is the 60 per cent ratio of brake cylinder air to that in control pipe 16 maintained at all times on the F-6 relay valve?***

A.—Yes.

***1409-Q.—What is the initial flow of air in the F-6 relay valve when control pipe 16 air is reduced?***

A.—When control pipe *16* air is reduced, air flows from chamber *A* and the check valve spring chamber to passages *16a* and *16*.

***1410-Q.—What takes place as the air in the spring chamber reduces?***

A.—As the pressure in the spring chamber reduces, chamber *K* air unseats check valve 51-b and flows to passages *16a* and *16*, reducing the pressure in diaphragm chamber *K* as control pipe *16* pressure is released.

***1411-Q.—What area is thus affected?***

A.—The effective pressure on the left face of diaphragm *38* is thus reduced proportionately.

***1412-Q.—What then takes place?***

A.—The greater force caused by the brake cylinder pressure on the right of main diaphragm *38* deflects the diaphragm to the left.

***1413-Q.—As the diaphragm is deflected to the left what movement results?***

A.—The piston *36* moves to the left relieving the pressure on the lower end of lever *43*.

***1414-Q.—What takes place when the pressure on the lower end of the lever is reduced?***

A.—Brake cylinder air then opens exhaust valve *23* and its piston *25* and flows to the atmosphere.

***1415-Q.—What results from a partial release?***

A.—Brake cylinder air will flow to the exhaust until the pressure on the right face of main diaphragm *38* is slightly below 60 per cent of control pipe *16* pressure.

***1416-Q.—Suppose that control pipe pressure is completely released?***

A.—In this event the exhaust valve and piston remain open, completely releasing brake cylinder air.

### F-8 Relay Valve

***1417-Q.—When an F-8 relay valve is used, to which chamber does control pipe 16 air flow after the inshot valve closes?***

A.—The air flows into chambers *A*, *N* and *K* after the inshot valve closes, preventing flow of air to chamber *P*.

***1418-Q.—What is the ratio of brake cylinder air to control pipe air on the F-8 relay valve?***

A.—80 per cent of control pipe *16* pressure is reproduced in the brake cylinder.

***1419-Q.—How does the operation of the F-8 relay valve compare with the F-6 type?***

A.—The operation is similar.

### F-1 Relay Valve

***1420-Q.—How does the F-1 Relay valve differ from the F-6 and F-8?***

A.—With the *F-1* relay valve no inshot portion is used.

***1421-Q.—How does the air from control pipe 16 flow through the F-1 relay valve?***

A.—Through strainer *17*, passages *16*, *16a*, *17*, *17a*, *18*, *18a*, *19* and *19a* to diaphragm chambers *A*, *K*, *N* and *P*.

***1422-Q.—What pressure is thus reproduced in the brake cylinders?***

A.—The pressure in control pipe *16* is reproduced in the brake cylinders.

***1423-Q.—How does the air flow during a release?***

A.—Release is the reverse flow of air into control pipe *16*.

# EDITORIALS

## A Basis for Planning

In the last decade alone many millions of dollars have been spent by the railroads of this country for maintenance and servicing facilities for diesel-electric locomotives. When this type of power began to be installed in substantial numbers the large and medium sized roads found themselves in the position of having to operate,—and at the same time maintain a new type of motive power without having the benefit of any past experience as a guide to the kind of shops and terminals needed to carry on the job efficiently and economically. Shops they had to have and they proceeded to build new shops and convert old ones to suit individual needs and patterned after a variety of individual ideas. The roads did, however, carry on the job and as daily experience produced the answers to many problems, the general character of facilities began to take shape.

The money that has been spent has not, by any means, been spent without rhyme or reason nor has any substantial part of it been wasted. In the light of ten years experience, though, much of it might have been spent for different purposes. That we now know and as matters now stand, the exploratory era of diesel shop and terminal design and construction is about over, and the basis for sound future planning is available.

Plans can not be made without facts. In engineering work the production of facts is synonymous with the collection of quantities of data. With respect to diesel facilities this has now been done and the railroad industry is indebted to the shop engineering committee of the Locomotive Maintenance Officers' Association, under the chairmanship of H. E. Niksch for assembling the data, by questionairre and otherwise, that was presented at the recent annual meeting of that organization in Chicago, an abstract of which appears on pages 77 to 81 of this issue. Here, for the first time, is not only a broad picture of what the railroads have done, but the arrangement and interpretation of the data serves as a guide to future planning.

This report is a presentation of the mechanical and electrical side of the maintenance work that the railroads have to do. The text of the report offers suggestions, of necessity general in nature, that will at least serve as a check list in any planning that any railroad, large or small, may need to do. When this information, limited though it may be, on the mechanical department's side of the shop problem is added to the shop structures and layout information available from A.R.E.A. Buildings Committee Reports during the past ten years we now have something upon which practical future decisions may be based.

It may not be out of order once again to suggest the great need for intelligent shop engineering as a controlling factor in planning future expenditures for diesel-electric facilities. The stakes are large and the potential savings over a period of years enormous. It is to be hoped that the engineering, mechanical and electrical groups in the industry may visualize the possibilities of collaborating in the production of additional data of such character that in the future no railroad need be at a loss for a place to turn to for "expert advice".

## A Big Accident From a Little Slip-Up

Performing one seemingly minor detail of a road's operating instructions—the carrying out of which cost but a fraction of a cent and a few seconds time—would have saved a crankcase explosion causing extensive material damage and serious injury to a fireman.

The history of this case dates back several months to when a three-unit freight diesel left its terminal hauling a scheduled freight train. The locomotive proceeded some 675 miles without unusual incident; then the engine in the center unit stopped.

When the engine stopped, the fireman found a fuel injector lay-shaft disconnected and the engine shut down. He connected the lay-shaft and started the engine but could not keep it running, due to low lubricating oil pressure. Movement with the engine shut down was made for the next seven miles.

A machinist at this point inspected the unit and found the lay-shaft again disconnected, no oil showing in the engine governor gage glass, and the engine oil very hot, although the cooling water temperature was not excessive. He connected the lay-shaft and started the engine, but lube oil pressure would not rise above 4 lb. He then shut the engine down and made an entry on the work report of the lead unit, stating that the middle unit was not to be used because of no lube oil pressure.

The train proceeded under the two good units to the next division point, some 125 miles away, where the crews were changed. The train departed this point with a total load approximately equal to 80 per cent of the tonnage rating for two units. It traveled a little over five miles when a crankcase explosion occurred as the fireman was attempting to start the engine. He was burned about the head and arms, and the engine sustained substantial damage.

No one thing can be said to have caused this accident. Inspection of the unit following the accident showed a number of defects which contributed to setting up the conditions under which the explosion could occur. And an entry was made on the lead unit to warn the crew against starting the troubled engine in the middle unit.

But one thing could have prevented the accident—attaching an isolation tag to the defective engine, as re-

quired by this and other road's instructions, which would have warned the fireman not to try to start the engine. This detailed overlooked by the mechanic was in a way less of a contributing cause to the accident than a number of other factors, such as some of the defects found on the engine at inspection, and the failure of the engine crew to read the work report which would have told them not to start the engine. It was nonetheless one small thing which would have prevented the accident if it had been done. As such, it can serve as a good lesson on the importance of paying attention to small details, and not to be in such a rush to get things done that operations are skipped which are seemingly small, but actually important.

## Flashovers

During the early years of diesel-electric locomotive operation, little was heard about motor and generator flashovers. To be sure there were not so many locomotives to cause them, but they must have been fairly common, since neither equipment nor maintenance procedures had reached their present high standards. Occasionally, someone would ask questions about flashovers, but it was done surreptitiously as if having flashovers was something like having a disease one didn't want to admit having. It seemed that to admit having them was to cast doubt on the quality of the locomotive or of the work done in the repair shop.

With the issuance of the Locomotive Maintenance Officers' report on this subject, it becomes plain that the reason for such reticence was that no one knew anything about them. This report, a summary of which appears in this issue, is a frank statement of the whole situation surrounding this subject. It is approached with a candor which is refreshing. From this kind of a beginning, good results are sure to follow.

And the report is not all in the negative. Many practices are listed which should reduce the frequency of flashovers. Summed up, they state that what is needed is good maintenance, with an emphasis on cleanliness and good operating practice. There must still be found ways and means for improving both, but with the kind of study now being made by the maintainers, the underlying causes and ways of correcting them are sure to be found.

## The Modern Freight Car—A Fluid Bridge

In an address at Harvard University last May, L. K. Sillcox, executive vice-president, The New York Air Brake Company, cited the bridge as a perfect mechanical connection between two points, otherwise it would collapse and expressed the striking analogous thought that: "A freight car is a fluid bridge between shipper and consignee, the administration and handling of which is spread from one part of the nation to the other." The necessity of keeping this "fluid bridge" in the best mechanical condition practicable under present conditions is obvious, if car utilization and shipper service are to be brought up to desired standards.

The first step in any organized attempt to improve present freight-car conditions and performance is to analyze mechanical failures and find out which car parts are giving most trouble. Mr. Sillcox pointed to five classifications of defective parts as responsible for the following number of freight-train accidents in 1949, the latest year for which such data are available: wheels and axles, 511; bearings and lubrication, 634; truck side frames and side bearings, 213; draft gears and couplers, 334; brakes and foundation gear, 234; all other failed parts, 924; total accidents, 2,850.

An examination of these figures will show that 32.4 per cent or almost one third of the accidents were due to the failure of car parts outside of the five classifications which simply emphasizes the fact that no car parts can be safely overlooked as regards inspection and maintenance if they have any bearing on reliable train operation. Of the five specific classifications, bearings and lubrication accounted for 22.3 per cent of the accidents. Wheels and axles were next, being responsible for 17.9 per cent. Draft gears and couplers were charged with 11.7 per cent.

In this connection the following interesting thought was presented by Mr. Sillcox: "We need, above all else, some sort of a simple indicator to show when anything is wrong in a train so that the engineman and the train crew can quickly take notice and protect the movement against disastrous wreck effects, such as have been all too common of late. The time will never come when we shall not have broken wheels or failed axles, cracked truck side frames or pulled out drawbars, hot boxes or foundation brake-gear failures, but there should be made available simple and positive means of immediately indicating when such parts are approaching a condition to cause failure. Any experienced car man knows that if we are to keep the hot box under control, intelligent car inspectors must be employed, and the rule of touching the end of the bearing with the bare fingers must be rigidly enforced, or its equal provided. The slightest dry spot at the end of the journal is indicative of trouble, and if a journal becomes overheated it does so gradually. At least two hundred to three hundred miles' notice of such a condition is usually present. The challenge is real—the solution evident—intensified inspection, adequate maintenance, both intelligently administered."

The difficulty which confronts railroads in successfully meeting the challenge mentioned by Mr. Sillcox is accentuated by what may be considered two conflicting objectives. One is the need for more careful and presumably more frequent inspection of freight trains in the interest of safety. The opposing need is to operate trains at ever increasing speed and with just as few and short stops as possible at intermediate terminals so that loads may be delivered to customers with minimum delay.

One thing which all responsible mechanical and car department officers will say is "We must have time and car-yard force necessary to inspect these trains!"

# NEW DEVICES

A Southern Pacific car hot-spray coated at San Francisco in February 1952.

## Hot-Spray Finish Applied Under Varied Conditions

Hot spray coated under widely varying conditions, from indoor laboratory control to midwinter weather, nearly 600 freight cars finished by means of the hot-spray application of enamel developed by the Sherwin-Williams Company, Cleveland, are currently in regular service on a number of railroads. Steel freight cars, tank cars and hopper cars have been hot-spray painted since the Pullman-Standard Car Manufacturing Company and the Sherwin-Williams Company jointly demonstrated the process last November at Michigan City, Ind.

The initial demonstration in the Pullman-Standard shops was under controlled conditions, but hot-spray enamel has since been successfully applied under divergent conditions. Pullman-Standard used the new process in finishing 250 steel freight cars for the Chicago, Rock Island & Pacific. Ten steel box cars that were hot sprayed for test in 1948 are also CRI & P cars.

Shippers Car Line Corporation employed the hot-spray method to finish tank cars at Milton, Pa., in January. This was done in two shops, one heated the other unheated.

Five Norfolk & Western steel box cars which were hot sprayed are now in rugged work-a-day operation. The Atlantic Coast Line is hot-spray finishing a number of freight cars experimentally.

One carrier, which now has about 80 hot-spray finished cars in service, painted six freight cars out-of-doors at Buffalo in February and these also are in regular service. The application was carried out in temperatures ranging from 24 to 32 deg. F.

A hot-spray coat is usually double the thickness of the conventional two-coat spray job.

The spray equipment consisted of a DeVilbiss MBC gun, with a 7-ft. extension whip. Three Bede unit heaters maintained the spray material at temperatures from 140 to 185 deg. F. at the gun. A circulating pump was employed. Paint was supplied to the heater by means of 40 to 60 lb. air pressure. Atomizing pressure was estimated at 40 to 50 lb.

Each of the 40-ft. steel cars was first primed with Chromate primer. In measuring the single hot-spray finishing coat with a Pfund gage, the indicated average thickness of the coat was two mils (thousandths of an inch). This compares with an average of one mil dry film thickness per coat on conventionally finished cars.

The tank cars hot sprayed in January by staff painters at the Shippers Car Line shops also averaged a finish coat of approximately two mils. The hot spray material was applied indoors, but, again for experimental reasons, in the heated and unheated shops. In the unheated shop the temperatures ranged from 40 to 43 deg. F., while out-of-doors it was actually a few degrees warmer. Humidity in this shop was estimated in the high 80's. In the heated shop the tank cars were dry to stencil in about three hours. In the unheated shop drying to stencil required about six hours. Overnight, however, the surface was tack free and thoroughly dry in spite of visible condensation on some parts of the tanks.

One rebuilt exterior-post car and one new interior-post car were hot sprayed by Southern Pacific painters in February at the Bayshore shops, San Francisco, and at the Sacramento shops. Prime coats were applied to both cars. These demonstrations were out-of-doors, with seasonally mild west-coast temperatures prevailing.

The heating equipment in both cases consisted of two Bede heaters in tandem, each rigged to an apparent potential of 185 deg. F. At San Francisco a pole type extension Binks spray gun was used, equip-

Hot-spray coat being applied outdoors in Buffalo demonstration at freezing temperatures and below.

ped with an internal-mix air cap. Best results were obtained with a No. 66 fluid tip in conjunction with this equipment. A pressure tank provided approximately 15 lb. pressure on the material and about 60 lb. atomizing pressure. Equipment in the Sacramento demonstration was the same except for a Binks spray pump, No. A-22, with 16 lb. material pressure equipment in standard used at the Sacramento shops.

The technical report on the San Francisco demonstration said in part: "The material, when applied at normal speed, was found to have a temperature at the gun of approximately 150 deg. F. This was quite satisfactory and allowed the proper film build without the problem of running or sagging. The wet film thickness, checked by a Pfund gage, was found to average approximately two mils over the entire surface. The average two-coat coal spray, when applied by conventional methods, is approximately one mil. Over-spray was hardly noticeable, being much less than when conventional methods are used.

"The application of one coat of hot-spray material required the same amount of time as the application of one coat of cold-spray material. However, the drying was much more rapid and stencils could be applied in approximately two hours after spraying. This will vary according to weather, humidity, etc. The gloss was increased by at least 15 per cent over two coats of cold-spray freight-car paint application."

At Sacramento the wet film averaged two mils in thickness and, according to the technical report, could be built to a three-mil thickness without sagging. "As this was a new car," the report added, "the surface preparation was better, excellent finish film was noted, and properties with regard to film tightness and gloss were particularly outstanding."

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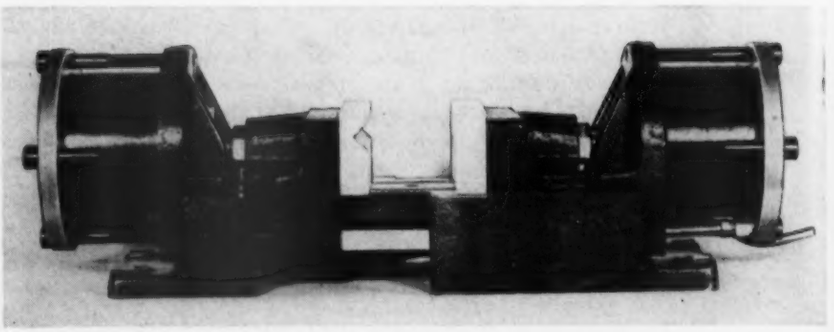
## Lead-Lag Ballast For Slimline Lamps

A lead-lag slimline ballast combining series economy and size with lead-lag performance and dependability is now available from the Westinghouse Electric Corporation. The new ballast is available in 38, 58, and 75-watt two-lamp sizes. A 25 per cent reduction in wattage losses now puts lead-lag in the series-ballast class for operating economy. New circuiting and improved production methods have reduced the size of the ballast to 3⅛ in. by 2⅝ in. by 13¾ in. with a corresponding reduction in weight. The initial cost of the lead-lag ballast approaches that of the series ballast. Stroboscopic correction as well as long lamp life is obtained through the lead-lag circuit.

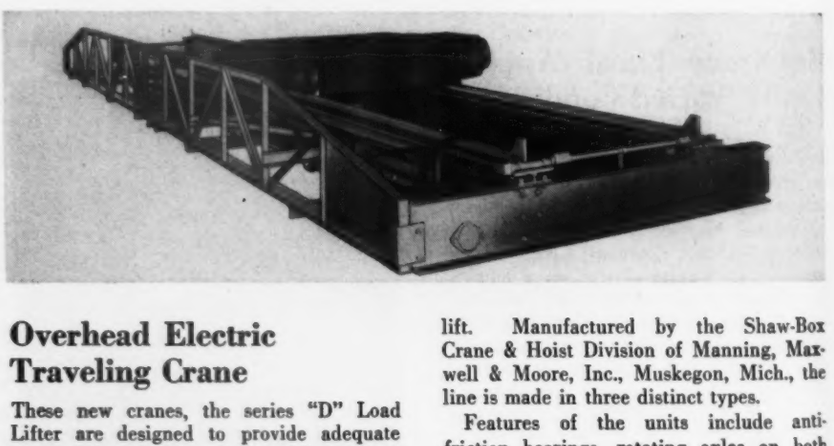


## Air Powered Mechanical Vise

The device consists of two opposed pneumatic cylinders mounted on a base with two master jaws at the ends of the rods attached to the pistons. These jaws travel along guides and are mechanically synchronized. Operating on 5 to 100 lb. air pressure, a clamping pressure up to 2,000 lb. may be obtained.

Developed by the Black Drill Company, Inc., Cleveland, the jaw tolerance from the center line is plus or minus 0.001 in. at any dimension of jaw closing, with a working range of 0 to 4 in.

Identified as the Centr-Finder, the vise requires less than 2 sq. ft. of bench space. Four bolts hold it in place. One air-line connection to a 4-way valve places it in operation. Each jaw is independently adjustable from the center line to accommodate work pieces other than symmetrical.



## Overhead Electric Traveling Crane

These new cranes, the series "D" Load Lifter are designed to provide adequate service for average industrial requirements. They require little overhead space but give high hook lifts and are available in a wide variety of speeds and heights of lift. Manufactured by the Shaw-Box Crane & Hoist Division of Manning, Maxwell & Moore, Inc., Muskegon, Mich., the line is made in three distinct types.

Features of the units include anti-friction bearings, rotating axles on both the bridge and trolley, variable speed magnetic control and gears operating in oil in sealed housings.

## Air Compressor Replacement Cylinders

Cylinders made of air furnace gun iron have been marketed as replacement parts for diesel locomotive air compressors. The dense pearlitic structure of these cylinders, fabricated by Hunt-Spiller Manufacturing Corporation, South Boston 27, assure long service and even-wearing qualities, according to the manufacturer.

By design refinements and casting techniques, approximately 42% has been added to the area of the heat-radiating fins. This area is concentrated at the head-end of the cylinders where heat dissipation, to a greater degree, is required.

# How Electro-Motive cuts your rebuilding costs

Repeated reductions in Electro-Motive flat-rate rebuilding prices—marked by the recent drastic cut in labor charges—are a source of savings every railroad executive should look into.

These savings—becoming effective during a period of inflation in other railroad operating costs—have been made possible by Electro-Motive's policy of bringing to *rebuilding* the same efficiencies and economies developed in original locomotive manufacture.

This has involved an extensive program of retooling and expansion in which our Factory Branches† have been completely transformed from job shops to assembly-line production-type operations.

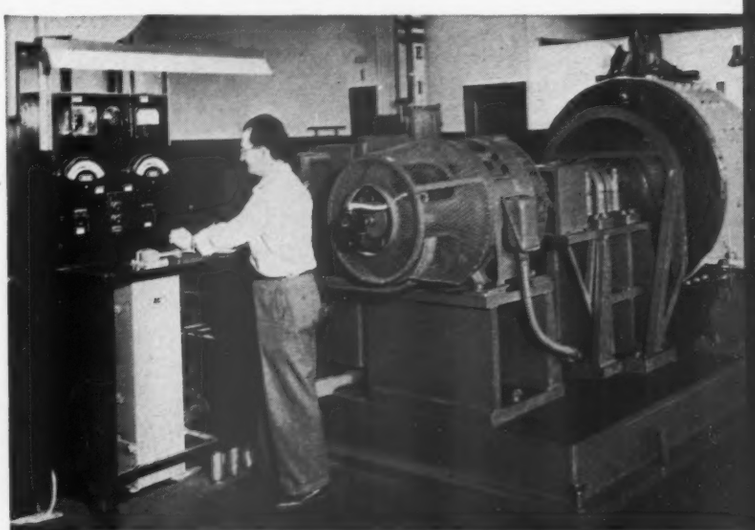
Here you see some of the efficient factory-type equipment installed in these plants. The latest laborsaving methods and techniques are used and are kept constantly up to date. Rebuilding is done in volume on a station-by-station basis. This means skilled workmen can be regularly employed to do specific jobs, and also that mass-production jigs, fixtures and tools can be economically justified. In addition, factory-type inspection and quality control enable us to give you a new-part guarantee on every assembly we rebuild.

Beyond this, and most important, each Electro-Motive Factory Branch is strategically located and equipped to handle the combined requirements of a number of railroads. This not only spreads fixed costs over a larger number of units, but also saves railroads the necessity of making major and unproductive investments in rebuilding facilities that would duplicate these. Finally, it enables railroads already operating facilities of their own to level out uneconomical peaks and valleys in production by letting Electro-Motive handle the overflow.

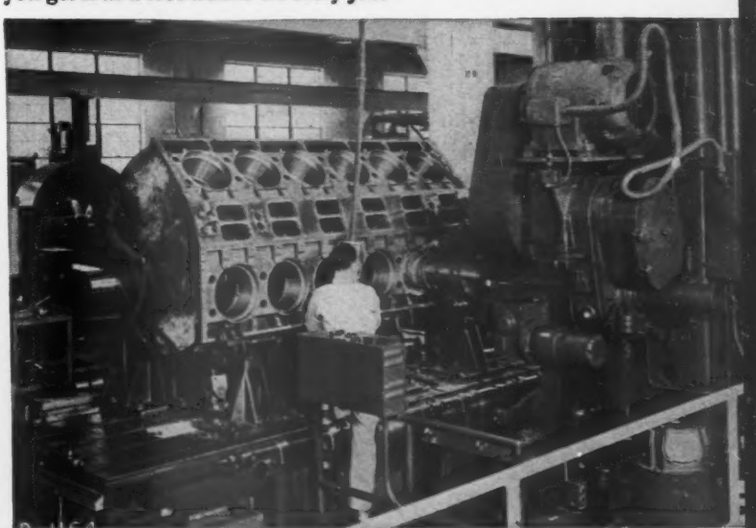
Thus—through its nationwide network of Factory Branches—Electro-Motive accepts responsibility to help railroads handle the volume of Diesel rebuilding that looms ahead. Our organization is geared to deliver top quality work at the lowest possible cost.

†Electro-Motive Factory Rebuilding Plants at La Grange, Ill.; Halethorpe, Md. (Baltimore); Jacksonville, Fla.; Robertson, Mo. (St. Louis); Los Angeles, Cal.; Emeryville, Cal. (Oakland). A seventh Factory Branch will be built at Salt Lake City, Utah. Branch Warehouses at Minneapolis, Minn. and Fort Worth, Texas.

**We Spend—You Save**—Machine tools like the one shown above are costly. This investment—and others like it—can only be amortized in a reasonable time through large volume operations. Machines such as this assure highest quality and cut time and costs—savings we pass on to you through lower prices.



**Testing Guarantees Quality**—Inspection of rebuilding jobs is just as careful and complete as the factory inspection given new production. This enables us to guarantee the rebuild the same as a new assembly. We "carry" this performance insurance for you—you get it as a free bonus on every job.



**The Right Tools for Every Job**—Our factory at La Grange and branches on both coasts are equipped to handle *any* rebuild job from unit injectors to crankcases and complete engines.

GENERAL MOTORS LOCOMOTIVES

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS
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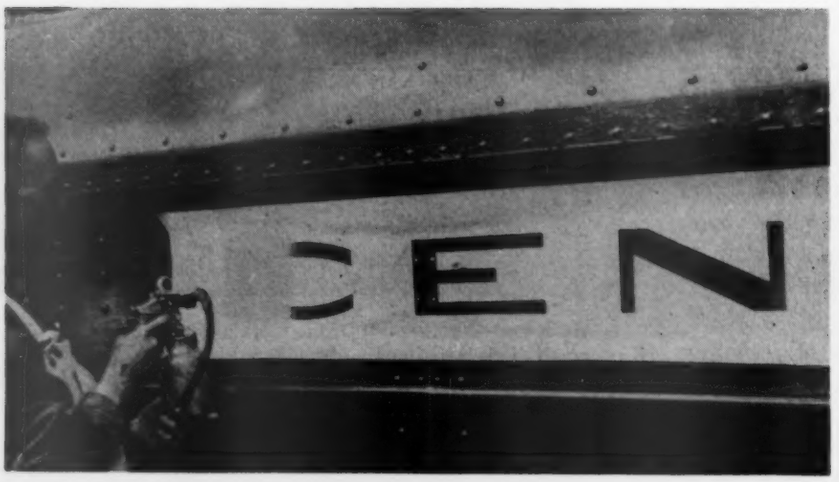


## Spray Lettering

Sprayed Lettering is a system for lettering trucks, railroad coaches, freight cars, etc., by means of a pre-cut stencil mask and a spray gun, using the better types of paint material that can be used only with a spray gun. This system was introduced by the C. O. Dicks Co., Detroit, Mich.

These masks are cut in quantity, to the customer's print or design, from a specially coated paper that is paint resistant. They adhere closely to a painted surface, yet are easily removed after spraying. Each stencil is used once in conjunction with an adhesive called Stickum.

The mask is placed in position and held at the top edge with a couple pieces of masking tape which acts as a hinge to lift the mask upwards and out of the way while a coat of the Stickum is applied with a paint brush, allowing to dry for about 5 minutes. The mask is then dropped back down into its original position. A small scrub brush is used to seal down the mask, which also removes the Stickum adhesive inside the letter openings in the same operation. The holding ties are cut and removed giving a solid, and not a stencil type of letter. The lettering color is then sprayed, and the mask can then be removed any time after spraying.

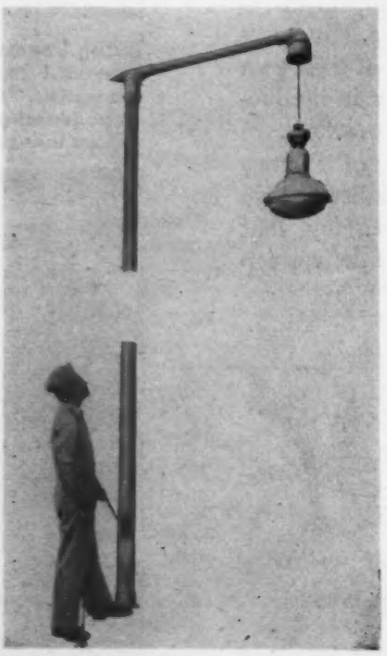
## Lighting Fixtures Serviced on the Ground

The Thompson Electric Company, Cleveland, Ohio, has designed a disconnecting and lowering hanger for use with fixtures mounted on new standard metal poles. The maintenance man works at ground level with a dead fixture (the live contacts stay at pole top), and there are no climbing or electrical hazards. In addition, the fixtures can be serviced with greater frequency and minimum cost. The poles are available in various heights.

The new unit includes a pole-top fitting complete with self-contained pulley, a divided mast-arm, the stainless steel operating cable and a mast-arm and fitting. The mast-arm, a high-strength aluminum alloy extrusion, contains a Y-shaped partition for both increased stability, and separation of the movable operating cable from the electrical wiring. Diameter and wall thickness of this arm are comparable to 2-in. extra-heavy pipe.

The mast-arm and fitting, incorporating the Thompson hanger mechanism, features a self-contained "plumbizer" that provides for 8 deg. adjustment either side of the centerline. This assures accurate vertical suspension of the luminaire, which is desirable for proper appearance and essential for operation of the hanger assembly.

The new Thompson pole-top hanger can be adapted to new standard metal poles



by means of a fabricated tenon insert in the top of the pole. Poles equipped with this disconnecting and lowering device also require a hand-hole, complete with pulley assembly, at the bottom for access to the operating cable. In addition, mast-arms ranging from 2 ft. to 12 ft. in length, in 2-ft. increments, are available for use with the pole-top assembly. When arm length exceeds 8 ft., additional bracing is required; this is furnished by the pole manufacturer. The units are available in either single or double arm models.

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## High Purity Aluminum Alloy

This new aluminum alloy, designated Alcoa C578, could be used as an economical and long-lasting replacement of chromium plating and stainless steel, according to its manufacturer. It is said to hold promise as a trim.

The product, which will take an Alumilite finish, has been developed by Aluminum Company of America, Pittsburgh 19. The alloy offers the added attraction of colored Alumilite finishes in many shades.

Alcoa C57S when treated, approaches aluminum in the transparency, metallic luster, and sheen of its finish, while offering good mechanical properties. It has, according to the manufacturer, excellent forming characteristics.

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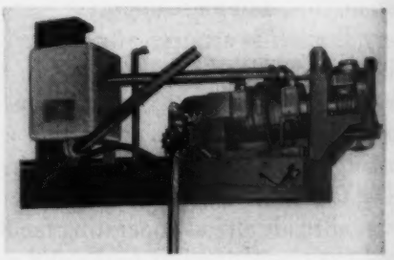

## Hack Saw Magnetic Clutch

A permanently adjusted magnetic clutch to control the automatic feed conveyor for mechanical hack sawing machines has been announced by the Peerless Machine Co., Racine, Wis. With the device, the sawing cycle becomes fully automatic, following loading of the conveyor to completion of the last cut on the length of stock.

The clutch embodies a new principle wherein solenoids and mechanical linkages are eliminated. It has only three major parts, the constantly rotating center plate and two armatures. When either magnet coil is energized, the armature disc and rotor plate are attracted, and then drive through friction in positive magnetic couple.

Machines equipped with the stock feed conveyor will automatically saw desired lengths from bar stock, tubing, squares, channels, web sections, I-beams, etc. The conveyor is available for Mechani-Cut hack saws in 7 in. by 7 in. and 11 in. by 11 in. capacities. Conveyors can be furnished in 12-, 16- and 20-ft. lengths.

*(New Devices continued on page 140)*

# "Tailor-made" for Railroad Diesels

# Esso Diesel Lubricating Oil

**A HIGH-QUALITY LUBE FOR REAL PROTECTION** — Esso offers "tailor-made" diesel locomotive lubricating oil (Diol RD) developed through years of field testing and research by both engine designers and Esso scientists to meet needs of railroad diesels. High-quality Esso Diol RD gives dependable lubrication protection.

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**BACKED BY CONSTANT FOLLOW-UP** — on-the-job check-ups by Esso Sales Engineers watch the dependable performance of Esso Railroad Fuels and Lubricants. Be sure to call on Esso for any railroad fuel or lubricating problem.

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# NEWS

## Wheel Report—A Correction

In the summary of the discussion of the report of the Mechanical Division Committee on Wheels at the San Francisco annual meeting on page 78 of the August *Railway Mechanical and Electrical Engineer*, one railroad was said to have reported two failures of F-36 wheels and that a third was found to be cracked. These failures were not F-36 wheels but A-40 wheels, and they were mentioned to call attention to the fact that the A-40 wheels, particularly in passenger service, are susceptible to the same types of failures as have previously been reported on F-36 wheels.

## D.T.A. Reports Apprentices Can Get Draft Deferment

The Defense Transport Administration's Manpower Division has issued a pamphlet describing requirements and procedures by which industry apprentices may qualify for deferment from Selective Service. The pamphlet is entitled D.T.A.-Manpower No. 5, "Deferment of Apprentices."

Selective Service regulations were amended by President Truman on June 27 to provide for deferment of "qualified industry apprentices." According to D.T.A., only apprenticeship programs in existence for at least one year, and which are "soundly sponsored and properly certified," will be eligible under this program.

## Mechanical Division Circular Letters

### Mechanical Lubricators on Interchange Freight Cars

In two circular letters dated September 4, the A.A.R. Mechanical Division announced advance approval of the application of mechanical journal lubricators of both the Hennessy and the Jeffers types to cars which move in interchange freight service, up to 1,000 car sets of each. The letters state that this does not constitute unlimited approval of these devices as now designed, but the action is taken so that service performance data may be secured, properly evaluated and further consideration given to unlimited approval.

For the benefit of car owners contemplating installation of these lubricators and for the information of railroad forces responsible for servicing the cars, the letters included general application and maintenance instructions supplied by the respective manufacturers who may be approached directly for further details as required.

One of the A.A.R. letters listed the numbers of individual cars equipped with journal lubricators supplied by the Hennessy Lubricator Company, Inc., 605 Guilford Avenue, Chambersburg, Pa. These included: Ten B&O express cars; 35 B&O hopper cars; 10 Pennsylvania express cars; 8 Southern box cars; 2 Union Pacific box cars; 3 Erie box cars; and 2 Wilson refrigerator cars.

Jeffers journal lubricators, furnished by the Fullo Corporation, 2608 Eastwood avenue, Chicago 25, were said to be applied to only a limited number of cars to date, but the second letter called attention to arrangements now being made to install

## ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE SEPTEMBER ISSUE

### Diesel-Electric Locomotive Orders

| Road | No. of Units | Horse-power | Service | Builder |
|---|---|---|---|---|
| Atlanta & West Point & Western of Alabama | 21 | 1,500 | General purpose | Electro-Motive |
| Canadian National | 40 | 1,500 | Road | Gen'l Motors Diesel Ltd. |
| | 6 | 1,200 | Road Switch | Gen'l Motors Diesel Ltd. |
| | 22 | 660 | Switching | Montreal Loco. Wks. |
| | 20 | 1,600 | Road | Canadian Loco. Co. |
| | 10 | 1,600 | Road | Montreal Loco. Wks. |
| | 2 | 1,000 | Switchers | Alco-G. E. |
| | 2 | 1,200 | | Electro-Motive |
| Chicago, Rock Island & Pacific | 30[2] | 1,500 | Road switch | Electro-Motive |
| Colorado & Southern | 10[3] | 1,500 | Switching | Electro-Motive |
| Detroit, Toledo & Ironton | 7[4] | 1,500 | General purpose | Electro-Motive |
| Fort Worth & Denver | 2 | 2,250 | Passenger | Electro-Motive |
| | 8 | 1,500 | Switching | Electro-Motive |
| Georgia | 2[5] | 1,500 | General purpose | Electro-Motive |
| Maine Central | 6[6] | 1,500 | General purpose | Electro-Motive |
| | 2[6] | 660 | Switching | Alco-G. E. |
| Minneapolis & St. Louis | 2[7] | 1,500 | | Electro-Motive |
| Western Maryland | 14[8] | 1,500 | | Electro-Motive |
| | 2B[8] | 1,500 | | Electro-Motive |
| | 10[8] | 1,600 | Road switch | Alco-G. E. |

### Electric Locomotive Orders

| Road | No. of locos. | Service | Builder |
|---|---|---|---|
| New York, New Haven & Hartford | 10 | Passenger | Not reported |

### Freight-Car Orders

| Road | No. of cars | Type of car | Builder |
|---|---|---|---|
| Allied Chem. & Dye Corp., Solvay Process Div. | 50 | Caboose | Company shops |
| Baltimore & Ohio | 12 | 40-ton refrigerator | Pacific Car & Fdry. |
| Bangor & Aroostook | 107[9] | 70-ton covered hopper | Pullman-Standard |
| Central of Georgia | 25[10] | Gondola | Pullman-Standard |
| Chicago, Rock Island & Pacific | 200 | 50-ton automobile box | Pullman-Standard |
| Detroit, Toledo & Ironton | 300[11] | Air dump | Baldwin-Lima-Hamilton |
| Illinois Central | 8 | 50-ton box | American Car & Fdry. |
| Missouri-Kansas-Texas | 500[12] | Insulated | Not reported |
| New York, New Haven & Hartford | 100[13] | 70-ton tank | American Car & Fdry. |
| Southern Pacific | 1,000 | 70-ton flat | Company shops |
| | 800 | Gondola | Company shops |
| | 100 | 50-ton pulpwood flat | Company shops |
| Texas Mexican | 30[14] | 70-ton gondola | Pullman-Standard |
| | | 570-ton hopper ballast | Pullman-Standard |

### Passenger-Car Orders

| Road | No. of cars | Type of car | Builder |
|---|---|---|---|
| Boston & Maine | 3[15] | Rail diesel | Budd Co. |
| Canadian National | 6[16] | Multiple-unit coaches | Canadian Car & Fdry. |
| | 12 | Trailer cars | Canadian Car & Fdry. |
| Illinois Central | 6[17] | Sleeping | Pullman-Standard |
| New York, New Haven & Hartford | 100[18] | Electric Multiple-unit | Not reported |

[1] For delivery in November. Estimated cost of each unit $151,000.
[2] These GP-7's to cost in excess of four million dollars. Delivery expected in first quarter of 1953.
[3] To be equipped with six-wheel trucks.
[4] For January delivery.
[5] Delivery scheduled for November. Estimated cost $324,000.
[6] Delivery scheduled for late fall.
[7] SD-7 type. Delivery scheduled for December. Cost, $372,000.
[8] Delivery expected during December and January. The 14 1,500-hp. units will be divided into two three-unit 4,500-hp. locomotives and four two-unit 3,000-hp. locomotives.
[9] Delivery expected in March or April 1953. These are in addition to 250 similar units ordered in July as reported in the August issue.
[10] Delivery scheduled for first quarter of 1953. Estimated cost, $178,750.
[11] To have nailable steel flooring. Delivery scheduled for December and January.
[12] Delivery scheduled for April 1953.
[13] The freight cars are for use primarily in shipping potatoes and paper. The passenger cars, to be of stainless-steel construction, will be air conditoned for commuter service.
[14] For delivery in second quarter of 1953. Cost of gondola cars, $199,500; of ballast cars, $39,335.
[15] For delivery late in 1952 or early in 1953. Order consists of two coaches and one combination coach-baggage unit. Approximate cost, $495,000.
[16] To be of lightweight steel and aluminum construction. Multiples of three units—a self-propelled motor coach and two trailer cars—may be used to make up trains of six, nine, 12, 15, or 18 cars. A train of three cars may be controlled from either the motor coach or the last trailer. Cars expected to be in operation before the end of the year.
[17] Delivery expected during third quarter of 1953. To be of a new 11-double bedroom design, with a public washroom and providing additional linen storage space.

*Notes: Colorado & Southern.* The C & S has been authorized to acquire 70 50-ft. and 30 65-ft. mill-type gondola cars and 20 70-ton covered hopper cars.
*Fort Worth & Denver.* The F W & D has been authorized to acquire 250 40-ft. steel box cars.

more of them in interchange freight service and said that a complete list of the railroads and car numbers involved will be furnished as soon as made available by the manufacturer.

### Replacing Old-Style Ball-Check Covers

A circular letter released by the division on September 4, 1952, calls attention to Interchange Rule 60, Sec. 1, Note 6 which requires replacement of the old-style ball-check cover with a new-style cover (Pc. No. 95051 or CV-101) on the emergency portion of AB brakes at the time of periodic attention. The important objective of this change is to minimize air leakage in brake systems in the interest of more effective and safe train braking, and, since the first of this year, the full cost of applying the new style cover has been included in the charge for periodic brake attention, as specified in Rule 111, Items 15 and 15-A.

According to the A.A.R. letter, a check by one railroad, subsequently confirmed by investigations of the Committee on Brakes and Brake Equipment, as well as the Mechanical Inspection Department, revealed that a considerable number of cars on which air brakes received periodic attention since January 1, 1951, still had old-style ball-check covers on the emergency portions. As a matter of fact, the study uncovered 391 of these AB valves with old covers in railroad service stock and 467 in private-car stock; also 13 valves with old covers applied to railroad cars and 17 to private cars. The period covered in the study was from January 1, 1951, to June 30, 1952. The circular letter urges that individual railroads take prompt steps to correct this condition.

## Stevens Receives Steam Locomotive Institute Endowment

The dissolution of the Steam Locomotive Research Institute, Inc., and the setting aside of its funds to establish scholarships for the sons of railroad men who made the "iron horse" an exciting symbol of the country's growth were announced at a luncheon at the Uptown Club, New York, on Friday, September 19, when R. P. Johnson, president of the research group, presented a $40,000 check for the scholarship endowment to Jess H. Davis, president of Stevens Institute of Technology, Hoboken, N. J.

The annual income from this fund will "assist one or more deserving sons of railroad men or sons of deceased railroad men" to obtain an engineering education, according to stipulations by the Research Institute. Students will be selected by Stevens and scholarships will be awarded according to individual need and ability. The endowment, Mr. Johnson explained, has been set up in the nature of a memorial to the traditions and accomplishments of the steam locomotive by the institute which has conducted development work for American locomotive builders.

In accepting the gift, Mr. Davis pointed out that among the contributions to the establishment of railroads in this country by the Stevens family, for whom the Stevens

## SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

Freight Service (Data from I.C.C. M-211 and M-240)

| Item No. | | Month of May 1952 | Month of May 1951 | 5 months ended with May 1952 | 5 months ended with May 1951 |
|---|---|---|---|---|---|
| 3 | Road locomotive miles (000) (M-211): | | | | |
| 3-05 | Total, steam | 16,898 | 25,454 | 92,389 | 134,220 |
| 3-06 | Total, Diesel-electric | 27,726 | 23,105 | 132,413 | 105,855 |
| 3-07 | Total, electric | 786 | 853 | 3,957 | 4,126 |
| 3-04 | Total, locomotive-miles | 45,441 | 49,413 | 228,826 | 244,220 |
| 4 | Car-miles (000,000) (M-211): | | | | |
| 4-03 | Loaded, total | 1,663 | 1,774 | 8,260 | 8,629 |
| 4-06 | Empty, total | 940 | 928 | 4,500 | 4,297 |
| 6 | Gross ton-miles-cars, contents and cabooses (000,000) (M-211): | | | | |
| 6-01 | Total in coal-burning steam locomotive trains | 30,886 | 45,023 | 166,539 | 229,563 |
| 6-02 | Total in oil-burning steam locomotive trains | 7,616 | 12,781 | 40,878 | 61,279 |
| 6-03 | Total in Diesel-electric locomotive trains | 78,148 | 65,344 | 367,801 | 295,853 |
| 6-04 | Total in electric locomotive trains | 2,245 | 2,388 | 11,042 | 11,328 |
| 6-06 | Total in all trains | 119,022 | 125,545 | 586,561 | 598,112 |
| 10 | Averages per train-mile (excluding light trains) (M-211): | | | | |
| 10-01 | Locomotive-miles (principal and helper) | 1.03 | 1.04 | 1.04 | 1.05 |
| 10-02 | Loaded freight car-miles | 40.00 | 39.70 | 39.60 | 39.30 |
| 10-03 | Empty freight car-miles | 22.60 | 20.80 | 21.60 | 19.50 |
| 10-04 | Total freight car-miles (excluding caboose) | 62.60 | 60.50 | 61.20 | 58.80 |
| 10-05 | Gross ton-miles (excluding locomotive and tender) | 2,863 | 2,812 | 2,815 | 2,723 |
| 10-06 | Net ton-miles | 1,313 | 1,316 | 1,303 | 1,272 |
| 12 | Net ton-miles per loaded car-mile (M-211) | 32.80 | 33.10 | 32.90 | 32.40 |
| 13 | Car-mile ratios (M-211): | | | | |
| 13-03 | Per cent loaded of total freight car-miles | 63.90 | 65.70 | 64.70 | 66.80 |
| 14 | Averages per train hour (M-211): | | | | |
| 14-01 | Train miles | 17.80 | 17.30 | 17.60 | 16.90 |
| 14-02 | Gross ton-miles (excluding locomotive and tender) | 50,467 | 47,928 | 48,824 | 45,403 |
| 14 | Car-miles per freight car day (M-240): | | | | |
| 14-01 | Serviceable | 45.30 | 46.50 | 45.20 | 46.00 |
| 14-02 | All | 43.00 | 44.40 | 43.00 | 44.00 |
| 15 | Average net ton-miles per freight car-day (M-240) | 110.20 | 113.10 | 110.20 | 112.20 |
| 17 | Per cent of home cars of total freight cars on the line (M-240) | 45.60 | 39.20 | 42.70 | 36.10 |

Passenger Service (Data from I.C.C. M-213)

| | | | | | |
|---|---|---|---|---|---|
| 3 | Road motive-power miles | | | | |
| 3-05 | Steam | 6,826 | 9,989 | 37,643 | 54,525 |
| 3-06 | Diesel-electric | 18,731 | 16,504 | 90,455 | 78,556 |
| 3-07 | Electric | 1,624 | 1,632 | 8,222 | 8,083 |
| 3-04 | Total | 27,181 | 28,124 | 136,327 | 141,164 |
| 4 | Passenger-train car-miles: | | | | |
| 4-08 | Total in all locomotive-propelled trains | 270,826 | 270,704 | 1,353,885 | 1,360,916 |
| 4-09 | Total in coal-burning steam locomotive trains | 34,321 | 51,857 | 198,331 | 287,447 |
| 4-10 | Total in oil-burning steam locomotive trains | 26,832 | 32,024 | 130,230 | 166,383 |
| 4-11 | Total in Diesel-electric locomotive trains | 191,745 | 169,495 | 933,770 | 820,796 |
| 12 | Total car-miles per train-miles | 9.72 | 9.41 | 9.74 | 9.49 |

Yard Service (Data from I.C.C. M-213)

| | | | | | |
|---|---|---|---|---|---|
| 1 | Freight yard switching locomotive-hours (000): | | | | |
| 1-01 | Steam, coal-burning | 853 | 1,218 | 4,544 | 6,524 |
| 1-02 | Steam, oil-burning | 163 | 244 | 846 | 1,231 |
| 1-03 | Diesel-electric[1] | 3,188 | 2,986 | 15,790 | 14,430 |
| 1-06 | Total | 4,200 | 4,473 | 21,299 | 22,317 |
| 2 | Passenger yard switching hours (000): | | | | |
| 2-01 | Steam, coal-burning | 26 | 48 | 158 | 258 |
| 2-02 | Steam, oil-burning | 11 | 12 | 58 | 66 |
| 2-03 | Diesel-electric[1] | 258 | 244 | 1,280 | 1,196 |
| 2-06 | Total | 328 | 338 | 1,664 | 1,689 |
| 3 | Hours per yard locomotive-day: | | | | |
| 3-01 | Steam | 6.80 | 7.60 | 7.20 | 8.10 |
| 3-02 | Diesel-electric | 16.20 | 17.30 | 16.70 | 17.60 |
| 3-05 | Serviceable | 14.10 | 14.20 | 14.50 | 14.50 |
| 3-06 | All locomotives (serviceable, unserviceable and stored) | 12.30 | 12.20 | 12.60 | 12.60 |
| 4 | Yard and train-switching locomotive-miles per 100 loaded freight car-miles | 1.74 | 1.74 | 1.78 | 1.78 |
| 5 | Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives) | 0.75 | 0.78 | 0.76 | 0.77 |

[1] Excludes B and trailing A units.

## SUMMARY OF MONTHLY HOT BOX REPORTS

| Month | Foreign and system freight car mileage (total) | Cars set off between division terminals account hot boxes: System | Foreign | Total | Miles per hot box car set off between division terminals |
|---|---|---|---|---|---|
| July, 1950 | 2,745,932,894 | ..... | ..... | 23,957 | 114,619 |
| August, 1950 | 2,937,455,020 | 7,422 | 15,490 | 22,912 | 128,206 |
| September, 1950 | 2,974,297,739 | 6,541 | 12,881 | 19,422 | 153,141 |
| October, 1950 | 3,165,997,915 | 4,343 | 8,935 | 13,278 | 238,439 |
| November, 1950 | 2,868,871,913 | 2,536 | 5,331 | 7,867 | 364,672 |
| December, 1950 | 2,813,042,212 | 2,278 | 5,968 | 8,246 | 341,140 |
| January, 1951 | 2,840,847,511 | 2,870 | 8,436 | 11,306 | 251,269 |
| February, 1951 | 2,425,226,454 | 4,528 | 14,063 | 18,591 | 130,452 |
| March, 1951 | 3,063,173,942 | 3,667 | 10,078 | 13,745 | 222,857 |
| April, 1951 | 2,996,562,763 | 3,702 | 8,914 | 12,616 | 237,521 |
| May, 1951 | 3,013,634,782 | 5,631 | 13,737 | 19,368 | 155,599 |
| June, 1951 | 2,874,873,495 | 7,074 | 15,376 | 22,450 | 128,057 |
| July, 1951 | 2,768,920,095 | 8,886 | 18,823 | 27,709 | 99,929 |
| August, 1951 | 3,009,371,111 | 9,023 | 19,092 | 28,115 | 107,038 |
| September, 1951 | 2,925,570,545 | 6,472 | 13,565 | 20,037 | 146,008 |
| October, 1951 | 3,116,490,095 | 4,131 | 9,053 | 13,184 | 236,384 |
| November, 1951 | 2,939,503,144 | 2,022 | 4,405 | 6,427 | 457,368 |
| December, 1951 | 2,752,316,133 | 2,130 | 5,398 | 7,528 | 365,611 |
| January, 1952 | 2,824,298,630 | 3,208 | 7,197 | 10,405 | 271,437 |
| February, 1952 | 2,809,162,671 | 2,723 | 6,473 | 9,196 | 305,477 |
| March, 1952 | 2,943,812,727 | 2,594 | 5,877 | 8,471 | 347,517 |
| April, 1952 | 2,766,313,714 | 3,826 | 7,759 | 11,585 | 238,784 |
| May, 1952 | 2,918,508,445 | 6,020 | 10,938 | 16,958 | 172,102 |

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Institute of Technology is named, were the first steam locomotive, the first charter for a railroad, the wooden railroad tie, the T-shape rail and the "hook-headed" railroad spike to hold them together. The latter inventions, slightly modified, are still in use.

## Franklin Receives A.A.R. Research Contract

To investigate materials used in freight-car-axle bearings, the Association of American Railroads has awarded a two-year contract to the Franklin Institute Laboratories for Research and Development, according to Dr. Nichol H. Smith, director of the laboratories. The project will be under the direct supervision of F. S. Chaplin, associate director in charge of mechanical engineering.

The research program will give special emphasis to obtaining the bearing material with the lowest friction through an investigation of the differences in the frictional properties of various materials, particularly when not sufficiently lubricated. A special machine will be developed by the laboratories to permit controlled tests under the desired combination of pressure, speed, temperature and oil supply.

The initial work will be concerned with the investigation of existing materials, but later on special materials may be developed.

The emphasis of the program on friction, according to Mr. Chaplin, is indicated by the increase in the occurrence of hot boxes on railways during hot weather. This suggests the possibility that a relatively small decrease in the temperature rise due to friction might result in a drastic reduction in the number of hot boxes.

## Gas Turbine Undergoing Test on C.&N.W.

THE 4,000-hp. Westinghouse-Baldwin gas turbine locomotive, which recently completed a series of tests on the Missouri-Kansas-Texas, is currently undergoing a 90-day service test on the Chicago & North Western. The single-unit locomotive has been assigned to passenger service between Chicago and Elroy, Wis.,—205 miles—handling the "Duluth-Superior Limited" westbound and the "Rochester-Minnesota Special" eastbound.

The test is being conducted in cooperation with the locomotive's builders—Westinghouse Electric Corporation and Baldwin-Lima-Hamilton Corporation.

The gas turbine locomotive on the Missouri-Kansas-Texas gave what Katy officers describe as "very satisfactory results." Between April 18 and July 1, the 4,000-hp. locomotive rolled up a total of 26,000 miles handling Trains 6 and 7 between Parsons, Kan., and Denison, Tex. Upon completion of the tests it was given a detailed inspection at the Parsons shops prior to taking on another assignment elsewhere. Of particular interest to Baldwin and Westinghouse engineers was the locomotive's operation in

*(Continued on p. 112)*

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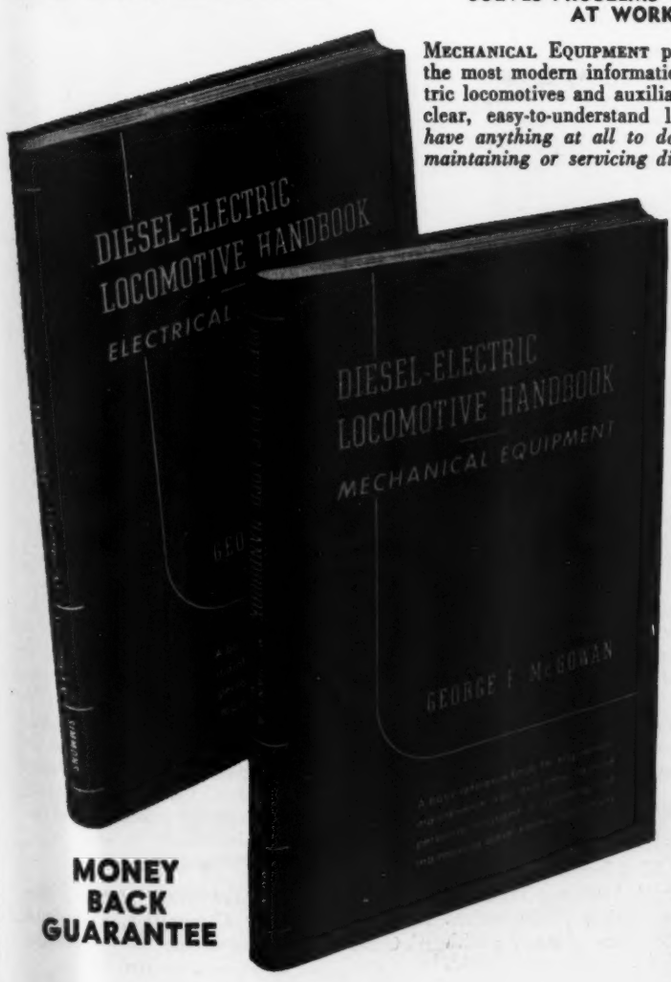


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(Continued from p. 108)

high, ambient temperatures of 'hog back" running through the states of Kansas, Oklahoma and Texas.

### British Railways Test Three-Car Diesel Train

A NEW British-built diesel train, designed to achieve economies on branch lines and some main lines, has begun experimental service out of London, as part of the British Railways, study of the possibility of using lightweight units for passenger traffic.

The train is similar to a bus in many ways. The driver sits at the front in full view of the passengers, operating only the main power and brake controls. The mass produced power unit is the same as those used in the latest London suburban buses. It gives a maximum speed of 48 m.p.h., and a cruising speed of 45.

The three-car train has two motor cars and an engineless trailer between, with a total capacity of 129 passengers and an unloaded weight of nearly 40 tons. It can be driven from either end, and in slack periods the trailer can be omitted, thus reducing weight. Maintenance costs are said to be low; fuel consumption is reportedly 5½ miles per gallon.

# SUPPLY TRADE NOTES

WESTINGHOUSE ELECTRIC CORPORATION.—*Lee C. Bennett* has been appointed middle Atlantic district transportation manager of the Westinghouse Electric Corporation. Mr. Bennett, who will retain his position as manager, marine and aviation departments, succeeds *L. A. Hester*.

◆

BALDWIN-LIMA-HAMILTON CORPORATION.—*Lewis A. Hester* has been appointed manager, locomotive sales, for the Baldwin-Lima-Hamilton Corporation, with headquarters at Eddystone, Pa.

Mr. Hester began his career as an electrical inspector with the Norfolk & Western. He joined the Westinghouse Electric Corporation in 1923 as a member of the graduate student course and later, worked succesively as railway application engineer; railway commercial engineer; and manager, transportation sales department. In 1946 he was appointed manager of the transportation department for the Middle Atlantic district, the position he held before becoming associated with Baldwin.

Lewis A. Hester

◆

SAMUEL MOORE & CO.—Samuel Moore & Co., Mantua, Ohio, has formed a new wholly owned subsidiary, the *Samuel Moore Seating Company*, which is acquiring the plant and business of *Tru-Car, Inc.*, of Kent, Ohio. Sales and service of Tru-Car seats to transportation industries will be handled by the Transit Products division of Samuel Moore & Co. Officers of the new company are *Samuel D. Moore*, president, and *Frank H. Olton*, vice-president. Operations in the Kent plant will continue under direction of *G. J. Diener*, shop superintendent.

◆

RAILROAD SUPPLY & EQUIPMENT, INC.—*C. D. Allen*, owner of the Allen-Calleri Corporation, has been appointed representative of Railroad Supply & Equipment, Inc., for the West Coast area.

C. D. Allen

◆

UNION ASBESTOS & RUBBER CO.—*Emil T. Johnson* has been appointed director, production and engineering, of the Fibrous products division of the Union Asbestos & Rubber Company, Chicago.

◆

DETREX CORPORATION. *L. Camel* has been appointed divisional general sales manager of the Industrial Chemical Division, and *D. E. Williard*, divisional general sales manager of the Industrial Equipment Division of the Detrex Corporation. Mr. Camel will direct the sale and service of the Chemical Division products. Mr. Williard will control the sales and service of solvent degreasing machines and solvents, and the mechanical washers used in industrial production cleaning.

◆

GENERAL AMERICAN TRANSPORTATION CORPORATION.—*R. W. Thompson*, chief engineer of the General American Transportation Corporation, Chicago, has retired after more than 34 years of service with the company.

BARCO MANUFACTURING COMPANY.—The Barco Manufacturing Company is constructing a new plant at 500-530 North Hough street, Barrington, Ill., for occupancy early in 1953. The new structure will provide 103,000 sq. ft. of floor space for officers, manufacturing, and other facilities, including a cafeteria for employees.

◆

GUSTIN-BACON MANUFACTURING COMPANY.—*Edward A. McCabe* has been appointed manager of the New York division of Gustin-Bacon. Mr. McCabe, who will be in charge of all glass fiber insulation, industrial and railroad division sales in New England, New York, New Jersey, Pennsylvania and Delaware, joined the firm in 1942. Previously he had been special engineer in the office of the executive vice-president of the New York Central System.

Edward A. McCabe

◆

AMERICAN LOCOMOTIVE COMPANY.—*George Y. Taylor* has been appointed director of personnel for the diesel locomotive and ordnance divisions of the American Locomotive Company at Schenectady and Auburn, N. Y. Mr. Taylor became associated with the company as director of education in September 1946. The Alco-GE diesel-electric locomotive school was organized under his direction.

◆

TWINSBURG-MILLER CORPORATION.—The Twinsburg-Miller Corporation, Twinsburg, Ohio, have appointed the *Spring Packing*

(Continued on p. 116)

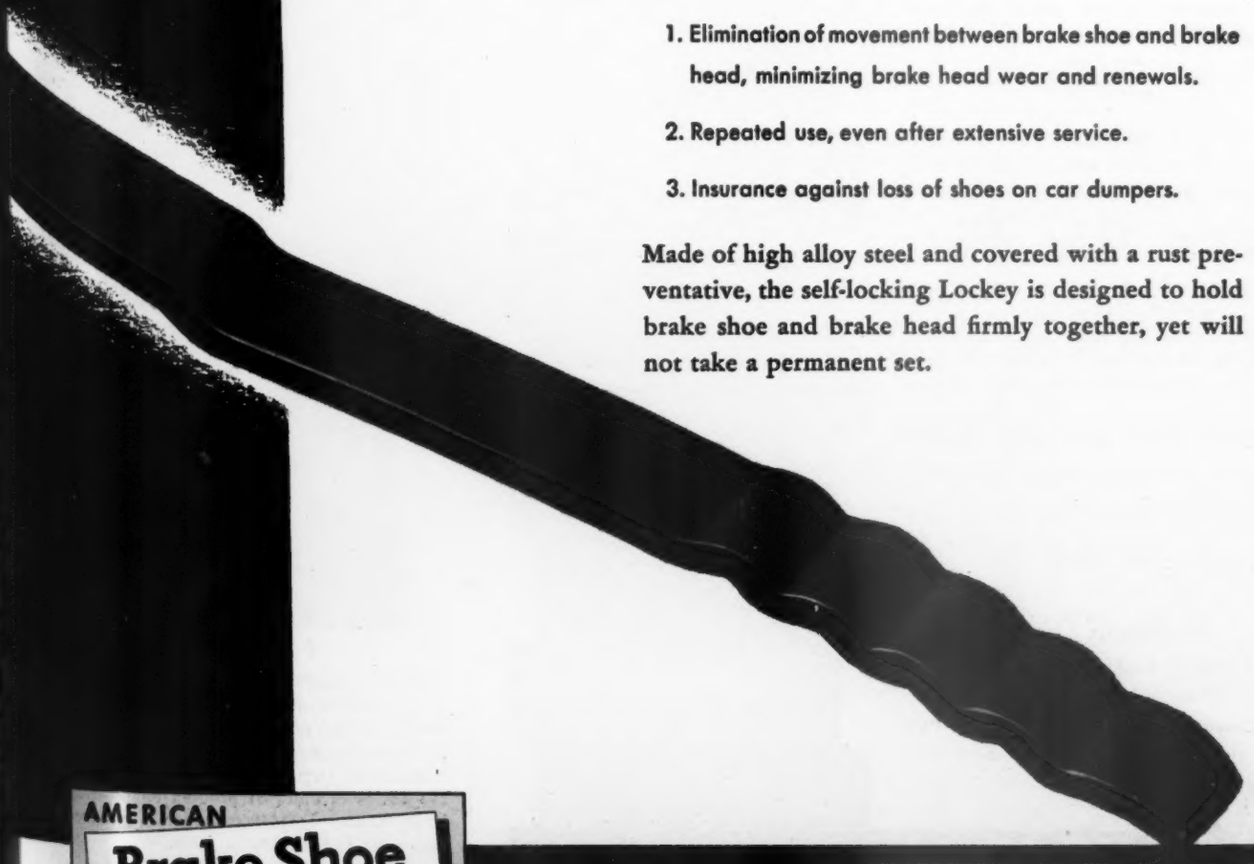
*the*

# SHOE LOCKEY

*provides* *GREATER ECONOMY*
*on freight equipment*

1. Elimination of movement between brake shoe and brake head, minimizing brake head wear and renewals.
2. Repeated use, even after extensive service.
3. Insurance against loss of shoes on car dumpers.

Made of high alloy steel and covered with a rust preventative, the self-locking Lockey is designed to hold brake shoe and brake head firmly together, yet will not take a permanent set.



AMERICAN
Brake Shoe
COMPANY

BRAKE SHOE AND CASTINGS DIVISION

# With One Cleaner in Stock YOU'RE READY FOR All THESE CLEANING JOBS!

There's no point in having different cleaners for any of the cleaning operations listed at the right. Magnus 5-RR will do a superlative job on every one of them.

**Faster**

. . . because Magnus 5-RR is a solvent soap, that works by dissolving greasy and oily dirt ingredients as well as by emulsifying them and by dispersing the solid ingredients.

**Better**

. . . because Magnus 5-RR is virtually independent of manual help. It does its fast cleaning on its own . . . careless brushing or scrubbing doesn't enter the picture at all.

**Safer**

. . . because Magnus 5-RR is harmless to any good surface coating. It's easy on the hands, too.

**Plus . . . Plus . . . Plus**

• 5-RR disinfects and deodorizes as it cleans • 5-RR rinses off quickly and easily without streaking or filming • 5-RR costs mighty little to use, because only small amounts, dissolved in water, are required.

**MAKE THIS 30-DAY TRIAL!**

*Order a trial drum of Magnus 5-RR. Use it according to our directions for 30 days. If you are not completely satisfied at the end of that period, we will gladly cancel the full amount of the invoice!*

*Railroad Division*
**MAGNUS CHEMICAL COMPANY**
77 South Ave., Garwood, N. J.
*In Canada—Magnus Chemicals, Ltd., Montreal*

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Headliners
Linoleum
Painted Surfaces of all kinds
Station Floors
Station Walls
Station Woodwork
Tile
Toilets
Varnished Surfaces
Washrooms

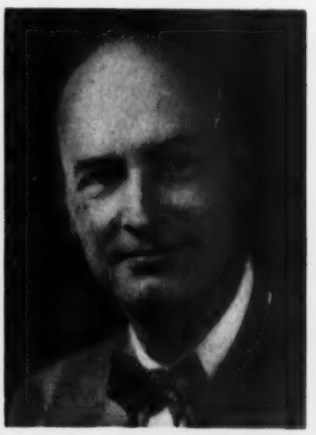
**Magnus CLEANERS AND CLEANING EQUIPMENT**
Representatives in all principal cities


*(Continued from p. 112)*

*Corporation*, Chicago, as distributor of Glasfab for the railroad industry. *W. H. Russell*, vice-president of Spring Packing, will be in charge of the promotion and sale of the product.

◆

LORD MANUFACTURING COMPANY. — *George E. Tubb*, general sales manager of the Lord Manufacturing Company has been appointed vice-president in charge of sales, and *Richard C. Henshaw*, manager of product and sales engineering, has been appointed manager of engineering.



G. E. Tubb

Mr. Tubb, a graduate of the University of Texas, served five years with the Weyerhauser Timber Company in the State of Washington, and was manager of the Order and Contract Division of the Wright Aeronautical Corporation at Woodridge, N. J., immediately prior to his association with the Lord organization early in 1949.

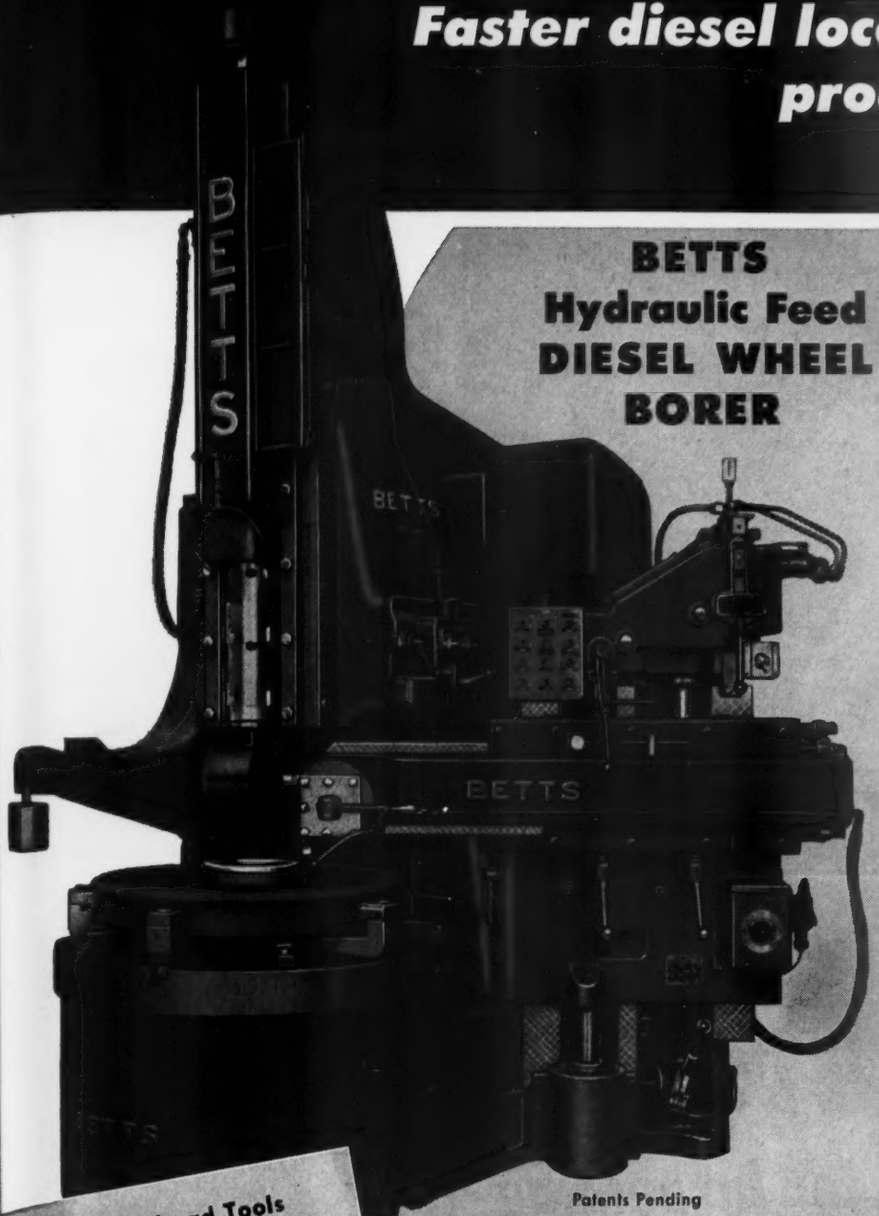
R. G. Henshaw

Mr. Henshaw was born in Butler, Pa. He is a graduate of the University of Pittsburgh, School of Mechanical Engineering. He became associated with the Lord company as an engineer in 1938. He assumed the duties of chief of product engineering in 1944, and became manager of product and sales engineering in 1949.

◆

ACME STEEL COMPANY.—*Howard H. Gamble* has been appointed special representative at Los Angeles for the Acme Steel Products Division of the Acme Steel Company, Chicago. *Ray D. Vilas* replaces

# *Faster diesel locomotive wheel production at less cost*




## BETTS Hydraulic Feed DIESEL WHEEL BORER

Patents Pending

**Long service life with low maintenance cost**

- Full automatic boring cycle, from loaded start to stop, with supplementary manual operation at any point in the cycle.
- Wide speed range for use of both high speed steel and carbide tools, with automatic speed reduction for combination carbide roughing and high speed steel finishing.
- Sidehead with hydraulic feed and rapid traverse through single lever control. Supplementary manual control for set-up and checking.
- Special five jaw automatic chuck designed to handle wheels either side up.
- Automatic brake stops table before spindle traverses upward.
- Boring sizes up to 12" diameter. Wheel tread diameters up to 48".
- Square-type ram with adjustable gibs on each side for maintaining closer, constant accuracy. Hydraulic cylinder in line with boring ram.

**Among Railroad Tools built by Consolidated are . . .**

CAR WHEEL BORERS
DIESEL WHEEL BORERS
BURNISHING LATHES
TIRE MILLS
END DRIVE AXLE LATHES
CENTER DRIVE AXLE LATHES
JOURNAL TRUING LATHES
DRIVING WHEEL LATHES
CAR WHEEL LATHES
RADIUS LINK GRINDERS
PROFILE MILLING MACHINES
SLAB MILLING MACHINES
ROD MILLING MACHINES
CYLINDER BORING MACHINES
KEYWAY MILLING MACHINES
CRANK PLANERS
DRILL PRESSES
AND OTHERS

Bores diesel locomotive wheels up to 48" tread diameter, and passenger or freight car wheels down to 30" tread diameter. Hydraulically operated sidehead, for improved hub turning and facing, has feed and rapid traverse vertically and horizontally. Other advanced features of this modern machine contribute to faster wheel production at lower cost. Full information will be furnished upon request.

**BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848**

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

# CONSOLIDATED
## MACHINE TOOL CORPORATION

SUBSIDIARY OF FARREL BIRMINGHAM COMPANY, INC.

# DUFF-NORTON

## Hydraulic JACKS

## ...for Inspecting and Renewing Journal Brasses?

No. 25-H-9.3 or
No. 25-H-7.5

It's the smooth, powerful and easy operation that makes lightweight Duff-Norton Hydraulic Jacks so popular with railroad men everywhere. These jacks—in 25 ton capacity—combine power, strength and long service life. You can't beat them for journal maintenance and repairs.

**Write for Bulletin AD-3R.**

STRENGTH, SAFETY, DURABILITY
DUFF-NORTON JACKS
ESTABLISHED 1883

THE DUFF-NORTON MANUFACTURING CO.
MAIN PLANT and GENERAL OFFICES, PITTSBURGH 30, PA.—CANADIAN PLANT, TORONTO 6, ONT.
*"The House that Jacks Built"*


Mr. Gamble as sales representative at Los Angeles. *E. J. McGraw,* sales representative, has been transferred from the Pacific Northwest to the San Francisco district, and *Arthur B. Hall* has been transferred from South Central California to San Francisco. *J. P. Brehm* has been appointed sales representative to replace Mr. Hall.

◆

GENERAL STEEL CASTINGS CORPORATION.—*W. C. Krautheim* has been appointed

W. C. Krautheim

chief mechanical engineer, and *R. E. Peters,* assistant chief mechanical engineer at Eddystone, Pa.

R. E. Peters

Since joining the company in 1917, Mr. Krautheim has served as assistant engineer, as assistant mechanical engineer, and as mechanical engineer since 1944.

◆

PITTSBURGH PLATE GLASS COMPANY.—*Richard P. Bell,* for the past six years paint sales manager at the Pittsburgh warehouse of the Pittsburgh Plate Glass Company, has been appointed assistant general paint manager of the firm's merchandising division.

◆

WROUGHT STEEL WHEEL INDUSTRY.—The Technical Board of the Wrought Steel Wheel Industry has moved to new quarters at 230 North Michigan avenue, Chicago 1.

◆

MCKAY COMPANY.—*Thomas S. Collins,* formerly with the Industrial Tape Corporation, has been appointed electrode repre-

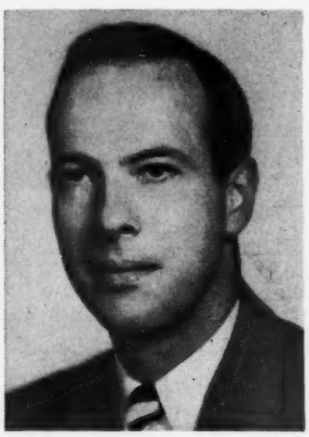
*(Continued on p. 125)*

*(Continued from p. 118)*

sentative for the Chicago territory of the McKay Company, Pittsburgh. Mr. Collins will maintain headquarters at 1500 South Western avenue, Chicago, and his territory will cover northeastern Illinois and northwestern Indiana.

◆

SAFETY CAR HEATING & LIGHTING CO.—*Harry W. Jones*, sales representative for the Safety Car Heating & Lighting Co. at Philadelphia, has been moved to the main sales



H. W. Jones

division at New Haven, Conn. *Hubert Medland*, sales representative at the Chicago office, has been transferred to Philadelphia to succeed Mr. Jones. *Gerald C. Beck* has

G. C. Beck

been appointed sales representative at Chicago. Mr. Beck formerly was supervisor of air conditioning and lighting with the Pullman Company.

◆

INLAND STEEL COMPANY.—*Albert W. McAbee* has been appointed assistant manager of sales in the railroad, pig iron and chemical division of the Inland Steel Company, to succeed *Leon C. Reed*, who has retired.

Mr. Reed, who joined Inland in 1909, worked his way up through several positions in the sales department to become

**You're starting off with the right brushes, sonny!**

Yes sirree!

From plaything to the real thing—from brushes for flea power motors to those rated at thousands of horsepower, each Stackpole brush grade is specifically designed for the particular equipment and operating conditions involved. Each is quality controlled from raw material to finished product. Each has proved its dependability and economy beyond question of doubt on much of the nation's foremost equipment.

**STACKPOLE CARBON COMPANY,** *St. Marys, Pa.*

**STACKPOLE**

*Brushes*

the first manager of the newly established Chicago district sales office in 1936. In 1944 he was appointed assistant manager of sales.

Prior to joining Inland in 1948, Mr. McAbee had been in the sales department of U.S. Steel in Pittsburgh and Chicago.

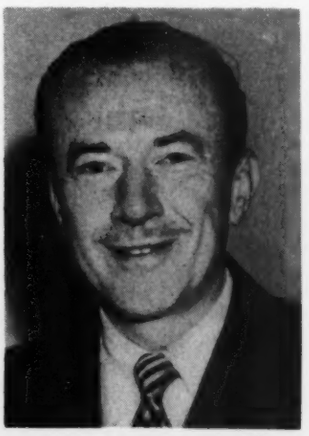
◆

MAGOR CAR CORPORATION.—*James W. Leis*, vice-president in charge of operations of the Magor Car Corporation, has retired after 42 years of service, but will remain as a member of the board of directors. *E. O. Lunde*, formerly chief engineer, has been appointed works manager.

PULLMAN COMPANY.—*George W. Bohannon*, manager of purchases and stores for the Pullman Company, has been appointed general manager, with headquarters remaining at Chicago. Prior to joining Pullman in October 1951, Mr. Bohannon was chief mechanical officer for the Chicago & North Western system.

◆

SHERWIN-WILLIAMS COMPANY. *R. H. Hill* has been appointed assistant general manager of transportation sales for Sherwin-Williams. Mr. Hill, who will headquarter in Cleveland, will supervise transportation sales activities during the absence of *C. B. Bull*, manager, who is convalescing from a protracted illness. Mr. Hill will continue also to serve as manager of the Atlantic Coast transportation zone.



R. H. Hill

Mr. Hill joined Sherwin-Williams in 1917 and has had wide experience in the marine, railroad and other transportation fields. He is a member of the New York Railroad Club and of other transportation organizations.

◆

WESTINGHOUSE AIR BRAKE COMPANY.—The Westinghouse Air Brake Company has announced formation of a research laboratory to serve all divisions of the company and its subsidiary and affiliated

Thomas Meloy

companies, including European companies in the Westinghouse group. *Thomas Meloy*, president of Melpar, Inc., Alexandria, Va., a subsidiary, has been appointed director of research for Westinghouse and chairman of a research and development committee representing the various divisions.

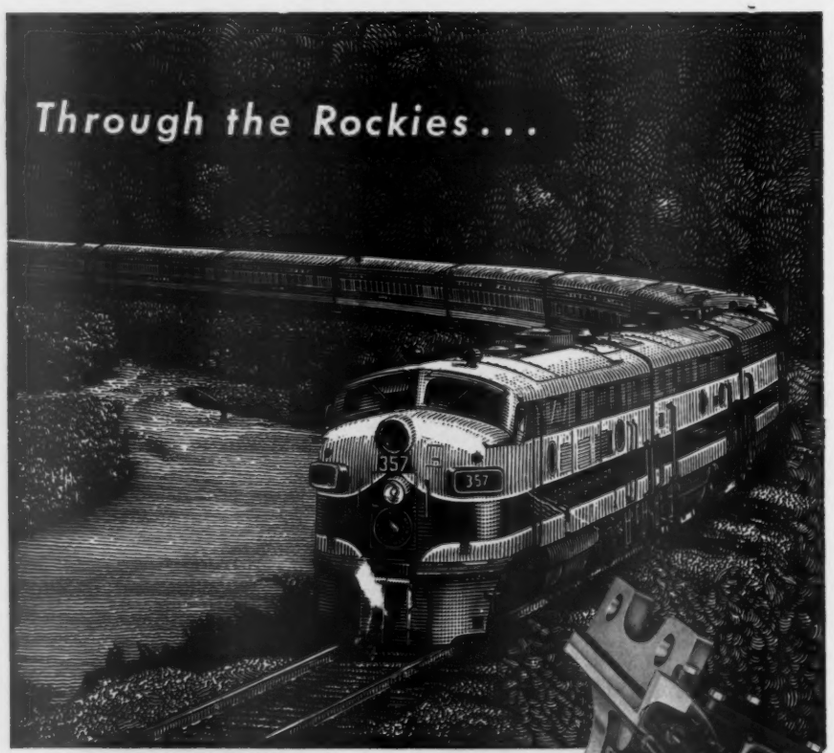
◆

AMERICAN CHEMICAL PAINT COMPANY.—The American Chemical Paint Company has acquired and is operating office and plant facilities at Niles, Calif.

◆

BUCKEYE STEEL CASTINGS COMPANY.—*Robert J. Wylie* has joined the sales staff of the Buckeye Steel Castings Company. Mr. Wylie has been in the railway supply business in St. Paul, Minn., for many years.

*(Continued on p. 130)*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From the first turn of the wheels in Chicago, through the rugged Rockies to Seattle and back again, the suspension bearings on G.N's. "Empire Builder" get full, continuous lubrication with modern FELPAX LUBRICATORS! Special felt wicks, that last thousands of miles, eliminate waste grabs and starved bearings caused by old fashioned yarn packing.

You can solve *your* suspension bearing lubrication problems, too, with FELPAX LUBRICATORS.

**For full information on Modern FELPAX Lubricators see your locomotive builder or write to:**

**the lubricator that eliminates repacking**

MILLER FELPAX CORPORATION
WINONA, MINNESOTA

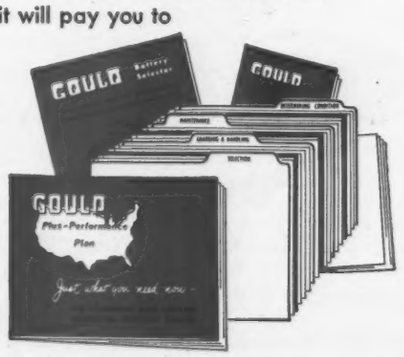
# YOU'VE MODERNIZED YOUR TRAINS...

# WHAT ABOUT BATTERY MAINTENANCE?

Gould "Z" Plate Batteries for Air Conditioning and Car Lighting

Your sleek streamliners require a lot more battery power than the trains of yesterday. If you haven't modernized your battery maintenance routine to keep pace with today's requirements, you're wasting ampere-hours, losing profit dollars. The Gould Plus-Performance Plan for battery maintenance may be able to extend the service of your lead-acid air conditioning and car lighting batteries as much as 50%! With batteries costing what they do, it will pay you to put this plan into operation *today!*

**GOULD PLUS-PERFORMANCE PLAN—** A library of technical information that tells you how to select, charge, maintain and determine the condition of lead-acid batteries. It's free. Write Gould Battery Information Headquarters for details.

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*Always Use Gould-National Automobile and Truck Batteries*

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## MECHANICAL ENGINEER

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Administrative ability and experience in freight car design required.

Will lead to full charge of Engineering Department of 25 Employees.

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MODEL 1100
TACHOMETER TESTER

ACCURATELY TESTS
ALL MAKES OF
PORTABLE TACHOMETERS
IN JUST A FEW SECONDS

TESTS at SEVEN SPEEDS
300, 500, 600, 720,
800, 1000, 1800 R.P.M.

JUST PLUG IT IN ON AC!
ACCURATE AS AN ELECTRIC CLOCK!

Precision-built by the makers of the famous Sweeney POWERENCH Tools

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Please send full information on your Portable Tachometer Tester
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*A Practical Evaluation of*

## Railroad Motive Power

By P. W. KIEFER
*Chief Engineer, Motive Power and Rolling Stock, New York Central System*

The first authoritative information in book form of the comparative advantages of standard types of railroad motive power—steam, Diesel-electric, and electric. Based upon the results of a study made by the New York Central System of comparative operating costs of all three types on main line divisions.

Contents

Foreword—Introduction—The Reciprocating-Type Steam Locomotive—Other Coal-Fired Steam Locomotives—The Gas-Turbine Locomotive — Electric Locomotives — Diesel-Electric Locomotives — Motive Power Potentialities—Conclusions.

1949. 66 pages, illus., tables, charts, 5½x8¾, cloth, $2.50.

★

## The Steam Locomotive

By RALPH P. JOHNSON
*Chief Engineer, The Baldwin Locomotive Works*

An authoritative treatise on the theory, operation and economics of the steam locomotive which includes comparisons with Diesel-electric locomotives. The subject matter is stripped down to fundamentals. Enough background is included to indicate paths of development.

1944. 2nd. 550 pages, 90 illus., 75 tables, 6x9, $6.50

★

*Shop Hints on*

## Locomotive Valve Setting

By JACK BRITTON

In natural sequence and with the aid of simple drawings, without puzzling mathematical formula, the author, a former apprentice instructor, shows how to follow through on most any valve setting job. Covers Stephenson link motion, Walschaert, Baker, Young, and Joy valve gears, and the Gresley lever arrangement. Takes the mystery out of valve setting.

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★

## 4-6-4 Locomotive and Tender Chart

Shows 315 numbered parts including all the latest equipment on a Hudson type passenger locomotive. Scaled elevation and four cross-sectional drawings.

40x30 inches, folded to 9½x12, $.50

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Please send me on Ten Days' Free Examination the book(s) and/chart checked below. If not satisfactory I will mail them back postpaid. Otherwise I will remit their list price.

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☐ Locomotive Valve Setting, $3 ☐ Locomotive and Tender Chart, $.50

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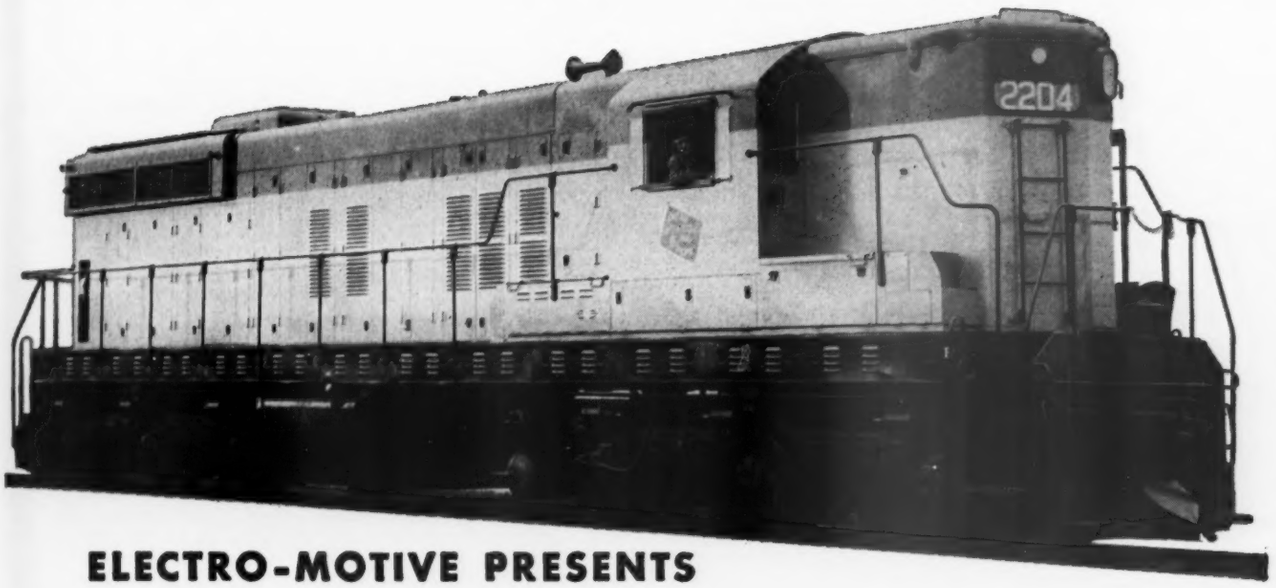
Company ..... Postion .....




**ELECTRO-MOTIVE PRESENTS**

## THE SD7 SIX-MOTOR ROAD SWITCHER—

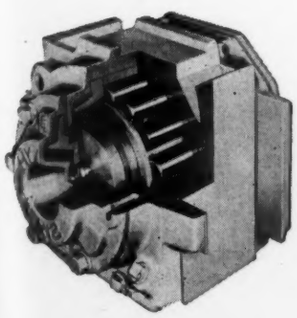
# HYATT-EQUIPPED

A six-motor, six-axle, heavy-duty road switcher—the SD7 is the first locomotive of its type to use the new Flexi-Coil truck equipped with Hyatt Roller Bearings.

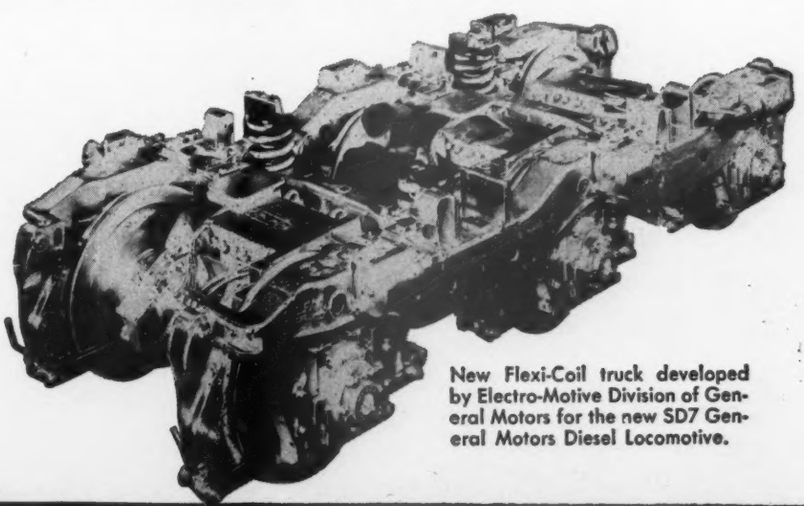
This new Electro-Motive development in switcher truck design embodies an entirely new principle in springing and permits riding quality comparable to the finest passenger locomotive.

High capacity straight radial Hyatt Roller Bearings, with resilient thrust blocks to cushion sidewise shocks make Hyatt Roller Bearing Journal Boxes the ideal choice for this new Flexi-Coil truck.

And too, the six motors in the new SD7 General Motors Diesel Locomotive are equipped with dependable Hyatt Traction Motor Armature Bearings. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.



Hyatt Roller Bearing Journal Box with resilient thrust unit as used on the GM Diesel Locomotives.



New Flexi-Coil truck developed by Electro-Motive Division of General Motors for the new SD7 General Motors Diesel Locomotive.

## HYATT ROLLER BEARING JOURNAL BOXES

(Continued from p. 126)

GENERAL MOTORS CORPORATION.—*R. L. Terrell* has been appointed manager of plant No. 3 of the Electro-Motive Division of the General Motors Corporation at Cleveland, Ohio, to succeed *A. G. Finigan*, who will retire in 1953 and who has been transferred to the staff of the works manager of the division at LaGrange, Ill. Mr. Terrell was formerly manager of the Southeastern region, with headquarters at Jacksonville, Fla.

*A. O. Myers* and *B. K. Wingerter* have been appointed, respectively, regional manager and district sales manager of the southeastern region of the *Electro-Motive Division* of General Motors Corporation at Jacksonville, Fla. Mr. Myers succeeds *R. L. Terrell*.

Plans for trebling the size of the Jacksonville, Fla., branch of the *Electro-Motive Division* of General Motors have been announced by N. C. Dezendorf, vice-president of General Motors and general manager of the Division at headquarters at LaGrange. The branch rebuilds major components of Diesel locomotives such as generators, traction motors, and Diesel engines, and is also a replacement parts distribution point. The present Jacksonville plant occupies 26,880 sq. ft. of floor space. This will be enlarged to 77,568 sq. ft. The new addition will be roughly in the form of a U built around the present plant, with a modern office wing stretching across the front. The Southeastern Regional offices of Electro-Motive Division, recently moved from Washington, D. C., to Jacksonville and

R. L. Terrell

now housed in the Atlantic National Bank Building Annex will be located in the new office building at the plant. Plans call for completion of the construction next spring.

◆

THOMAS A. EDISON, INC.—*Wallace M. Schleicher* has been appointed general sales manager of the Edison storage battery division of Thomas A. Edison, Inc.

Mr. Schleicher, who holds an engineering degree from Lehigh University, this

Wallace M. Schleicher

year completed 25 years of continuous service with the company. He joined the sales engineering department in March 1927 and was appointed section head in 1930, sales engineer in 1939 and commercial engineer in 1944. As commercial engineer, he has been responsible both for application and service engineering and associated sales activities.

◆

UNITED STATES STEEL COMPANY.—*Fred H. Lucas* has been appointed manager of structural and plate sales of the United States Steel Company, succeeding *A. H. Warren, Jr.*, who has retired after 43 years of service with the company.

Mr. Lucas joined U.S. Steel as an apprentice in the Ambridge, Pa., plant of the American Bridge Company in 1909. He joined the Carnegie Steel Company in 1930


Wilkinson

**High Speed Diesel Lube Oil Transfer Pump**

**REDUCE your Diesel lube oil handling time by more than 41% and eliminate oil spillage. Use the WILKINSON lightweight air-operated transfer pump. Only weighs 15 lbs. and *no air enters drum or oil.***

**You can pump a 55-gal. barrel S.A.E. #40 lube oil in 5 minutes with only one man.**

**Can furnish ready-to-use,—package consisting of WILKINSON Transfer Pump, 35 feet of ¾" oil hose, and automatic shut-off valve.**

**HUDSON 3-5221**

**WILKINSON EQUIPMENT & SUPPLY CORP.**

**6958 South Wentworth Avenue, Chicago 21, Illinois**

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**THE LARGEST SUPPLIER OF RAILROAD CAR WHEELS**

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Member AAR ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

# Take a look at *Strand*

**and you'll see why it's the finest flexible-shaft equipment made today**

This particular machine is the new 4-speed Strandflex. No belts are used—a patented gear-drive assembly mounted on the motor permits quick, easy, positive speed change. Entire motor-drive unit, including even the starting switch, is completely enclosed to seal out dirt, dust and grit—and give you many *extra* years of trouble-free service.

The STRAND line of flexible-shaft tools—manufactured by the N. A. Strand Division of the Balmar Corporation, a wholly-owned Franklin subsidiary—includes, also, belt machines up to 3 hp. It provides a selection of portable, easily controlled, light-working-weight tools which can be used in tight places, on the bench or floor, for—*grinding—polishing—buffing—wire brushing—rotary filing—sanding—nut setting—screw driving.*

Each of our offices has STRAND equipment available for demonstration at any time you suggest. If this is not practical, won't you write for one or more of the following:

**Remember—with STRAND the operator lifts the tool only—not the heavy motor.**

**Catalogue #31**—Single-speed and three-speed countershaft types—½ to 3 hp
**Bulletin #43**—Four-speed "Strandflex" gear type—¼ to ½ hp
**Bulletin #47**—Rotary files and cutters
**Bulletin #48**—Wire brushes
**Bulletin #49**—Abrasive and grinding attachments
**Bulletin #50**—Buffing and rubbing attachments

REG. U.S. PAT. OFF.

## FRANKLIN RAILWAY SUPPLY COMPANY

A CORPORATION

NEW YORK • CHICAGO • MONTREAL

STEAM DISTRIBUTION SYSTEM • BOOSTER • RADIAL BUFFER • COMPENSATOR AND SNUBBER
POWER REVERSE GEARS • FIRE DOORS • DRIVING BOX LUBRICATORS
JOURNAL BOXES • FLEXIBLE JOINTS

*EXCLUSIVE RAILWAY DISTRIBUTORS FOR: N.A. STRAND FLEXIBLE SHAFT EQUIPMENT*
*IRVINGTON ELECTRICAL INSULATION AND VARNISH*


as a structural engineer, became manager of sales in the structural and plate division at Chicago in 1936, and assistant manager of sales in the Pittsburgh office in 1947.

*J. P. D. Gerrese* has been appointed chief engineer of the *National Tube Division* of the United States Steel Company, at Gary, Ind.

◆

YALE & TOWNE MANUFACTURING CO.—*John I. Somers*, formerly assistant manager of the hoist department of the Yale & Towne Manufacturing Co., has been appointed sales manager for Worksaver electrically operated hand lift trucks. *T. F. Moriarty*, has been appointed sales manager for manually operated hand lift trucks.

### Obituary

FRED W. ALGER, assistant vice-president of the Pullman-Standard Car Manufacturing Company, died at his home in Chicago on August 3. Mr. Alger began his carbuilding career in the shops of the American Car & Foundry Co. at Detroit in 1923, later transferring to A.C.F.'s sales department in New York. Subsequently he became associated with the Standard Steel Car Company as sales agent, then joined Pullman-Standard in 1930 when Standard Steel was acquired by the Pullman group of companies. In May of this year he was transferred to the Birmingham sales office, but had been unable to take up his new duties because of illness.

# PERSONAL MENTION

### Atlantic Coast Line

DAVID H. NOBEL appointed traveling electrical foreman at Wilmington, N. C.

### Boston & Maine

W. H. CHAPLIN, assistant to superintendent of locomotive maintenance, appointed assistant general diesel foreman at Boston Diesel Terminal.

RAYMOND F. MCCAFFREY, foreman at Charlestown (Mass.) terminals, appointed assistant to superintendent of locomotive maintenance at Boston.

M. A. THOMPSON appointed supervisor of welding

### Canadian National

V. R. SPEARE, master mechanic on the Edson division, appointed master mechanic on Hudson Bay division.

### Chesapeake & Ohio

O. R. LAMB, road foreman of engines, Piedmont-Washington subdivision, has retired.

FLOYD R. JAHNKE appointed car foreman at Cheviot, Ohio.

*(Continued on p. 138)*

# Self-locking *Elastic Stop* nuts

## Cut maintenance costs

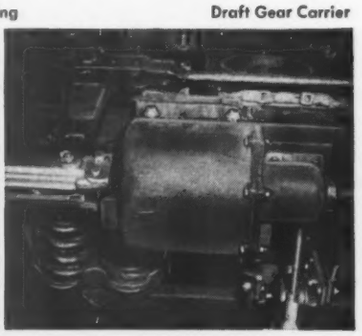
**Specified on D.L.&W.'s PHOEBE SNOW**

The constant vibration and jarring impact of high speed passenger service require a bolting method that will guarantee safe fastenings at a reasonable cost. That's why the D. L. & W. specified vibration-proof Elastic Stop Nuts at key points on their famous Phoebe Snow, replacing obsolete double nut and castellated nut assemblies. Now, two years of outstanding service on Phoebe Snow passenger cars have again demonstrated the dependable, trouble-free performance and long-range economy of these self-locking fasteners. Elastic Stop Nuts hold fast against vibration; cut maintenance costs because they do not require constant inspection and re-tightening; can be removed without damage to bolt threads . . . and are reusable.

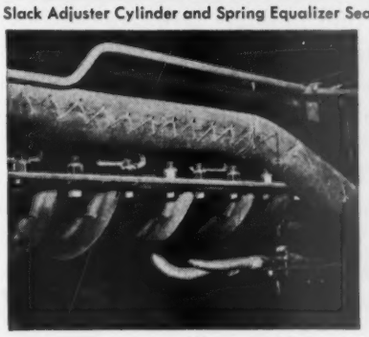
Elastic Stop Nuts' famous Red Elastic Collar is self-sealing . . . retains its unshakable grip under any amount of shock or vibration. It keeps internal bolt and nut threads rust-free . . . will not deteriorate in oil at temperatures up to 250°F. . . . permits easy removal for replacement and repair. Elastic Stop Nuts are reusable. Specify fibre inserts for applications where nuts are only removed occasionally; nylon inserts where repeated reuse or constant adjustment is required.

Center Truck Casting and Shock Absorber Mounting

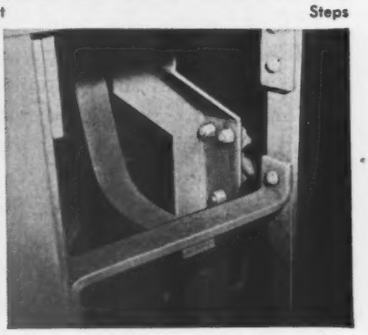
Draft Gear Carrier



Slack Adjuster Cylinder and Spring Equalizer Seat



Steps



***MAIL COUPON*** **for further information on ESNA self-locking fasteners for locomotives, passenger and freight cars.**

**Dept. N14-1023, Elastic Stop Nut Corporation of America**
**2330 Vauxhall Road, Union, N. J.**

Please send me:

☐ Elastic Stop Nut Railroad Application Folder

☐ Here is a drawing of our product. What ESNA fastener would you suggest?

Name_____ Title_____

Firm_____

Street_____

City_____ Zone____ State_____

**ELASTIC STOP NUT CORPORATION OF AMERICA**
**IS ALSO MAKER OF THE ROLLPIN**

ROLLPIN TRADEMARK

"Buffalo" Tips on Better MAINTENANCE

*"Buffalo" Universal Iron Workers permit up to 3 operations at once—no waiting for access to the various tools.*

Railroad repair shops are putting formerly slow, tedious fabrication jobs on a fast production basis by using a single machine which can cut, punch and shear simultaneously. The "Buffalo" Universal Iron Worker has a shear head, a punch head and a bar and angle cutter. The "Buffalo" U.I.W. is available in a wide range of sizes, with punch capacity from $13/16$" x $7/16$" to $1\frac{3}{4}$" x $1\frac{1}{2}$". Shear capacities range from $\frac{3}{8}$" plates to $1\frac{1}{2}$" plates. Standard barcutter knives handle angles, tees, beams, channels, rounds and squares, while special knives may be had for special shapes. Models are available, also, with built-in notchers and copers. Thousands of these heavy-duty fabricators now serving industry.

**FACTS ON FABRICATION!**

*Bulletin 360, shown, has useful information on speeding up fabrication operations—write for your copy!*

75 YEARS

"Buffalo" MACHINE TOOLS

**BUFFALO FORGE COMPANY**

174 MORTIMER ST. BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING SHEARING CUTTING BENDING

(Continued from p. 132)

F. E. LAWRENCE, assistant road foreman of engines, appointed road foreman of engines, Piedmont-Washington subdivision, with headquarters at Charlottesville, Va.

M. E. SANDRIDGE appointed assistant road foreman of engines, with headquarters at Charlottesville, Va.

### Chicago & North Western

R. C. GAETH appointed acting electrical supervisor at Chicago.

H. F. HINSEY, electrical supervisor at Chicago, has been granted a leave of absence because of illness.

### Chicago, Burlington & Quincy

D. F. CARTER, assistant electrical engineer—equipment, appointed electrical engineer—equipment, at Chicago.

F. W. DUNNING appointed engineer of tests at Aurora, Ill.

J. E. GARDNER, electrical engineer—equipment at Chicago, has retired.

### New York, New Haven & Hartford

WILLIAM J. HARLOW, assistant general mechanical superintendent, appointed general mechanical superintendent at New Haven.

*Career*: Entered the service of the New Haven in 1923 as an electrical helper at the Dover Street enginehouse, Boston. Subsequently served as electrician, night foreman, shop foreman and general foreman

**William J. Harlow**

before going to New Haven in 1947 as assistant master mechanic. In 1948 appointed general foreman of the new diesel-electric shop at New Haven; in 1950, promoted to assistant superintendent of locomotive maintenance, and in 1951 assistant general mechanical superintendent.

### Chicago, Milwaukee, St. Paul & Pacific

A. G. HOPPE, engineer of research and development, appointed mechanical engineer at Milwaukee. Office of engineer of research and development abolished.

H. H. MELZER, assistant mechanical en-

gineer, appointed chief engineer of tests, with headquarters at Milwaukee.

D. C. SHEFFIELD appointed engineer of tests (diesel), with headquarters at Milwaukee.

G. H. KOESTER appointed assistant to superintendent of motive power, with headquarters at Milwaukee.

### Chicago, Rock Island & Pacific

F. R. HOSACK, general superintendent motive power at Chicago, appointed general superintendent car department, and F. J. SCHLEIHS, master mechanic at Des Moines, Ia., appointed general superintendent for motive power at Chicago. These appointments were announced in the August issue but were incorrectly placed under another railroad.

### Norfolk Southern

M. B. DOWDY, assistant to chief mechanical officer, appointed assistant chief mechanical officer, with headquarters at Norfolk, Va.

Born: January 6, 1917.

Career: Began career with Norfolk Southern as a carman apprentice on March 17, 1936. Upon completion of apprentice-

M. B. Dowdy

ship on June 26, 1940, became air brake mechanic. On January 1, 1944, appointed chief mechanical inspector, and on June 1, 1948, assistant to chief mechanical officer, which position has now been abolished.

### New York Central

H. R. MCILVEEN appointed general diesel supervisor, locomotive maintenance, at New York.

W. C. SHIFFER appointed general foreman, Root Street coach yard, Chicago.

E. P. Moyer appointed special inspector, with headquarters at Chicago.

CARL J. GUSTAVSON appointed general foreman, 61st Street, Englewood, Ill.

### Michigan Central

R. S. GATES, assistant master mechanic, appointed master mechanic at Jackson, Mich.

C. R. HEMING, master mechanic at Jackson, Mich., has retired.

### Minneapolis, St. Paul & Sault Ste. Marie

F. JOHNSON, traveling engineer, appointed master mechanic at Minneapolis.

G. S. STANTON, master mechanic at Minneapolis, has retired.

### Pennsylvania

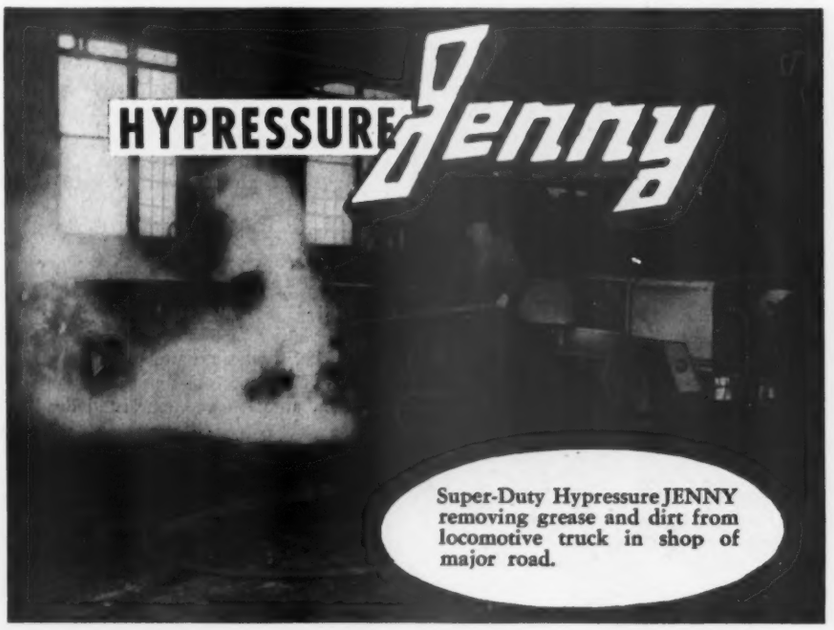
R. C. JOHNSTON, assistant master mechanic, Pittsburgh and Conemaugh divisions, appointed master mechanic, Chicago division.

J. M. LOY, assistant foreman, office of chief of motive power, Philadelphia, appointed general electrician, office of general superintendent of motive power, Central Region, Pittsburgh.

C. W. GARMON, foreman car shop, Toledo, appointed foreman car repairs, Pitcairn, Pa., Pittsburgh division.

D. J. PROKOP, assistant foreman, C. T. Yard, Conway, Pa., appointed foreman car shop, Toledo, Eastern division.

J. M. CARPENTER, assistant master mechanic, Maryland-Delmarva divisions, appointed assistant master mechanic, Pittsburgh-Conemaugh divisions.


Super-Duty Hypressure JENNY removing grease and dirt from locomotive truck in shop of major road.

*Mechanized* CLEANING
SPEEDS SHOP ROUTINES

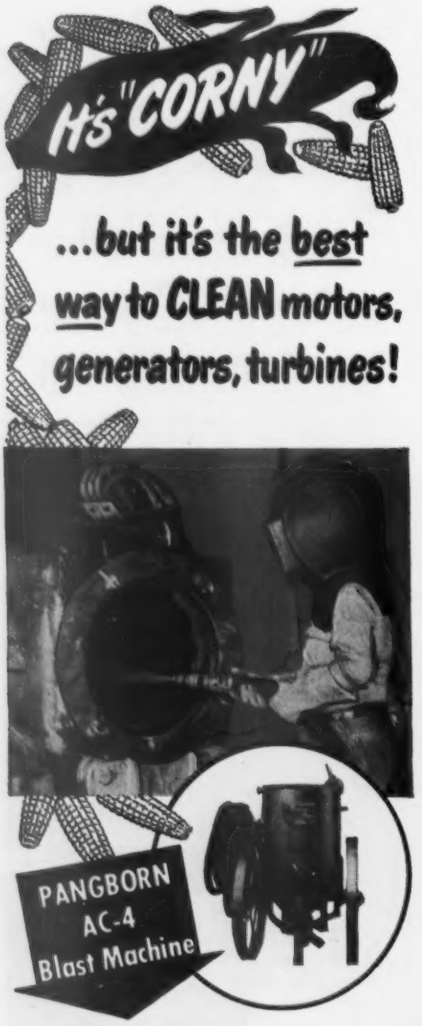
Hypressure JENNY Steam Cleaner gives shop schedules a big lift. By cleaning running gear parts and sub-assemblies, up to 60% production time is saved. Your skilled shopmen can get down to the job at hand without wasteful "make-ready." And Hypressure JENNY does the job in one-tenth the time that hand methods require. Other jobs include car cleaning, cleaning station and shop floors, walls, windows, etc.

JENNY, the original and only fully patented steam cleaner, is manufactured by Homestead Valve Mfg. Co. Portable, self-contained, it rolls to the job; and from a cold start, is ready for use in less than 90 seconds. Models and capacities for every railroad need.

*Write for complete information.*

Exclusive Distributors to the Railroads

148 ADAMS AVE., SCRANTON 3, PA.
Phone Scranton 2-7391




- CUTS DOWN-TIME
- CLEANS WITHOUT SOLVENTS
- ELIMINATES DRYING
- ELIMINATES TOXIC AND EXPLOSIVE DANGERS

THE new Pangborn AC-4 Blast Machine cleans motors, generators and turbines faster . . . cleaner . . . and lets you use them sooner because there's no waiting for parts to dry. In fact, dangerous solvents that can lead to explosions, caustic action, and toxic poisoning are completely eliminated!

The AC-4 uses soft, 20-mesh corncob grits to rapidly remove dirt, grease, old paint, etc., in one-third the time, and at 90% less cost than old-fashioned methods. GET FULL DETAILS . . . write, telling us what you clean, to: PANGBORN CORP., 3700 Pangborn Boulevard, Hagerstown, Md.

*Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment*

Pangborn

BLAST CLEANS CHEAPER with the right equipment for every job


D. M. PECK, assistant engineer-motive power, office of electrical engineer, Philadelphia, appointed assistant master mechanic, Northern division.

### *PERSONAL MENTION*

#### *Obituaries*

JOHN A. RABUCK, retired mechanical engineer of the Louisville & Nashville at South Louisville, Ky., died on July 7.

PAUL H. SMITH, engineer of tests of the Chicago, Burlington & Quincy at Aurora, Ill., died suddenly of a heart attack at his home on August 17.

## New Devices

(*Continued from page 104*)

### Black Asphalt Undercoating

The coating, a sprayable material called EC 1189, is designed to protect underbody parts of transportation equipment from corrosion, abrasion and for sound deadening.

For corrosion and abrasion control, it can be used to protect the exteriors of storage tanks, tank trucks, and railroad cars against spillage and water and soil. It will also protect the exteriors of railroad signal bungalows and the bottoms of outdoor switchgear housings.

For sound deadening, the formulation can be used on the interior panels of trucks and railroad cars.

Made by the Minnesota Mining and Manufacturing Co., Detroit 2, it will adhere to most materials and surfaces. When sprayed or brushed to a ⅛ in. thickness, it dries in about 48 hr. to form a tough, rubbery surface.

◆

### Synthetic Rubber Valve Shield

For use on valves handling acids and other hazardous chemicals, the shield protects the operator from injury if the valve stem packing should fail. It cups the stem and the packing gland and prevents acid from spraying.

The shield is flexible and is molded in the shape of a flower pot. Where necessary, the edge of the skirt can be trimmed to suit the contour of the valve body. It can be turned back to inspect the valve or to tighten the packing gland nuts.

Originated in a du Pont chemical plant,


For Efficient Annealing and Stress Relieving . . .

JOHNSTON CAR BOTTOM FURNACES

Engineering experience is apparent in the smooth mechanical operation of the Johnston Car Bottom Furnace. Roller bearings in car and door hoist shafts, and power operated car pullers are just a few of many practical features. Johnston "Reverse Blast" low pressure burners for oil or gas assure clean, economical, efficient heat for annealing, normalizing, and stress relieving.

*Write for Bulletin R-240*

Over Thirty Years Experience in the Design and Manufacture of

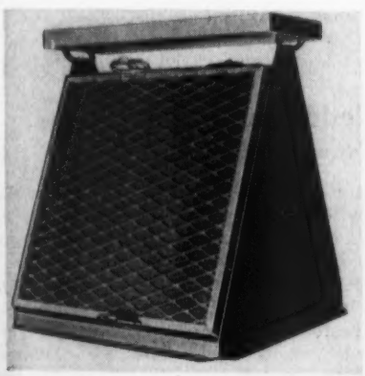
Burners • Blowers • Furnaces • Rivet Forges
Fire Lighters • Tire Heaters • Allied Equipment

THE JOHNSTON LINE — JOHNSTON MANUFACTURING CO. 2825 EAST HENNEPIN AVE. MINNEAPOLIS 13, MINN.

ENGINEERS & MANUFACTURERS OF INDUSTRIAL HEATING EQUIPMENT

the shields called Chex-Spray are manufactured by Industrial Products Company, Philadelphia 33. They are available in three sizes, accommodating valve sizes from ¾ to 4 in.

◆



## Grease Eliminator

Prevents accumulation of grease or lint in duct systems, protects motor and blower equipment, reduces maintenance costs and is said to provide better ventilation.

This unit, manufactured by the Farr Company, Los Angeles 45, was designed for installation in kitchen ventilating systems where exhaust ducts present a fire hazard. It is available in a wide variety of sizes and finishes to match existing equipment.

A tray which catches dripping grease that has been accumulated by the filters is suspended below the unit. Filters are quickly removed and snapped back into place and may be cleaned simply by flushing under a hot water tap.

◆

## Plexiglas Reflectors

An injection molded Plexiglas material with 2900 optical lenses per sq. in. has been introduced for all types of signs requiring night legibility.

Named Reflexite by its manufacturer the Reflexite Corporation, New York 5, the material is considered suitable for railroads as it is said to be resistant to weather deterioration, corrosion due to sulphuric acid and fractures from flying stones.

The product can be used for the following categories of railroad signs: speed control boards; stop signs; multiple track, mile post and whistle post signs; and reflectorization of non-electrified cabooses.

◆

## Cold Process Galvanizing Compound

A method of cold galvanizing for surface protection of steel and iron has been announced by the Galvanite Corp., New York 1. The process, which utilizes "Galvanite" is not a paint, but a cold galvanizing compound. It may be applied with any ordinary paint brush, electric spray gun or by cold dip.

Iron or steel surfaces coated with the Galvanite create an electro-chemical union, thereby uniting the zinc with the base metal's surface. It offers cathodic protection and leaves a coating of 96 parts, by weight of pure zinc.

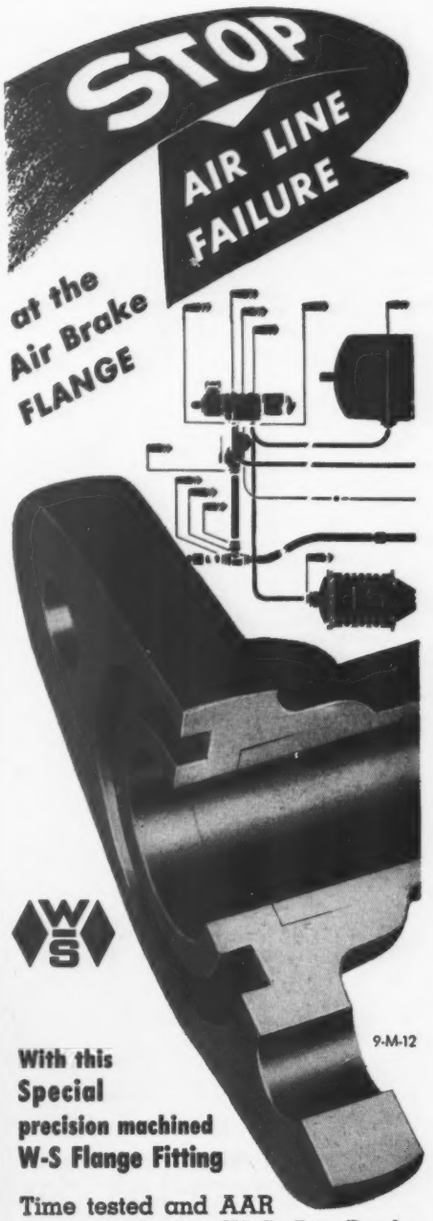
The product can be applied directly to the object, regardless of size. A single coating will give a coverage of approximately 625 sq. ft. per gal. Within 40 min. after application, it will be tack-free and will dry for use, within 48 hr.

◆

## Fireproof Drapery Material

A synthetic fiber, permanently fireproof drapery material having the appearance and feel of wool is now being marketed under the name Infinity Fireproof Fabrics. They are recommended wherever fire codes must be considered.

Introduced by Edwin Raphael Co., Inc., Chicago 10, the fabrics are woven as a full spun Saran-face material. They are said to be mildewproof, mothproof, have


With this Special precision machined W-S Flange Fitting

Time tested and AAR approved, the W-S Air Brake FLANGE is now standard equipment on thousands of cars — on many roads. It cuts the number of piping failures on air-brake systems . . . keeps rolling stock in service.

Drop forged for strength . . . it's lighter in weight, less cumbersome to handle because it's made in one piece. And, when positioned and welded, is shock and fatigue resistant.

Not one single failure reported in over 5 years of service . . . test it yourself and be convinced. Write for Bulletin R-1 to get more information.

DISTRIBUTOR PRODUCTS DIVISION

WATSON-STILLMAN

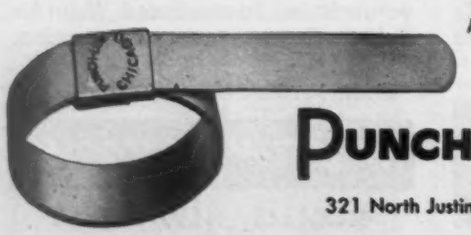
ROSELLE, NEW JERSEY

## Punch-Lok Hose Clamps

### Last the Life of the Hose

Locked for safety, and bound to hold pressure without damage to the hose, Punch-Lok Hose Clamps will not loosen from vibration. Built for strength and permanence Punch-Lok gives you a streamlined, leakproof hose connection that lasts the life of the hose itself.

See Your Near-by Punch-Lok Distributor



*"The Sign of a Good Hose Clamp"*

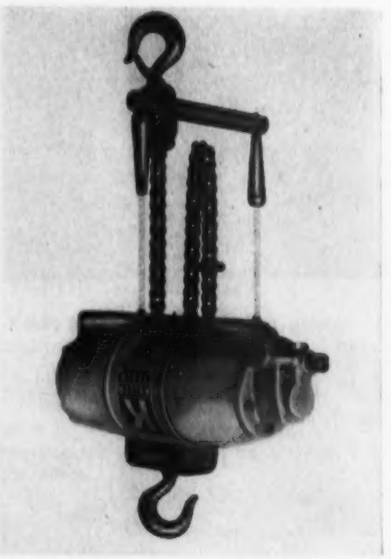
PUNCH-LOK company

321 North Justine Street, Chicago 7, Illinois


dimensional stability, dry rapidly and need no ironing.

These fabrics have been woven in weights suitable for usage as a flat surface material for printing, textured casement drapery and heavier weights in solid or patterned weaves.

◆



## Redesigned Pneumatic Hoist

Experience with their line of air hoists has led to many improvements in design and construction. These lightweight units (a 1,000-lb. capacity hoist weighs 30 lb.) are made by the Keller Tool Company, Grand Haven, Mich.

Features now regularly incorporated include: safety hooks that are standard for the load hook and optional for the suspension hook and and improved lubrication system.

The brake has been redesigned for more positive operation and an extra bearing has been added to the motor drive shaft. In addition, the control lever is made heavier for rough usage and ring gears are hardened for longer wear. Pendent controls for handling unwieldy loads and accessories for operating convenience have been made available at extra cost.

◆

## Blind Assembly Clinch Nut

Recommended applications are for blind assemblies or to furnish additional threading depth for application of bolts in thin metals. Product of the Grip Nut Company, Chicago 4, the nut is round with a hexagon-shaped pilot which fits into a hexagon-shaped hole in the metal to which it is being applied. This pilot is then pressed down and flattened out, clinching the nut securely.

The nuts can be used on aluminum, brass or other metals which cannot be projection welded and are available with standard threads or with deflected locking threads. They can be applied after the mating parts have been painted or enameled.